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**Technical Inspection Report
Bureau of Ordnance Group**

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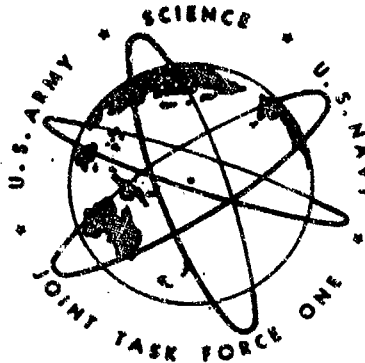
OPERATION CROSSROADS.

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By *John H. Dayette*

TESTS 'A' AND 'B'.
VOLUME I.
PARTS I THRU VII [u] (8)

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Volume 1

Director
Defense Atomic Support Agency
Washington, D. C. 20301

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**Joint Task Force ONE
Director of Ship Material**

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DIRECTOR OF SHIP MATERIAL
JOINT TASK FORCE ONE

BUREAU OF ORDNANCE MATERIAL GROUP
FINAL REPORT FOR TESTS "A" AND "B"

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Director
Defense Atomic Support Agency
Washington, D. C. 20301

2 December 1946
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SECRET

ENCLOSURE (D)

Subject: Final Report for Tests "A" and "B".

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S-E-C-R-E-T

Enclosure (D)

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Bureau of Ordnance Material
Group Final Report for Tests
"A" and "B".

PART I

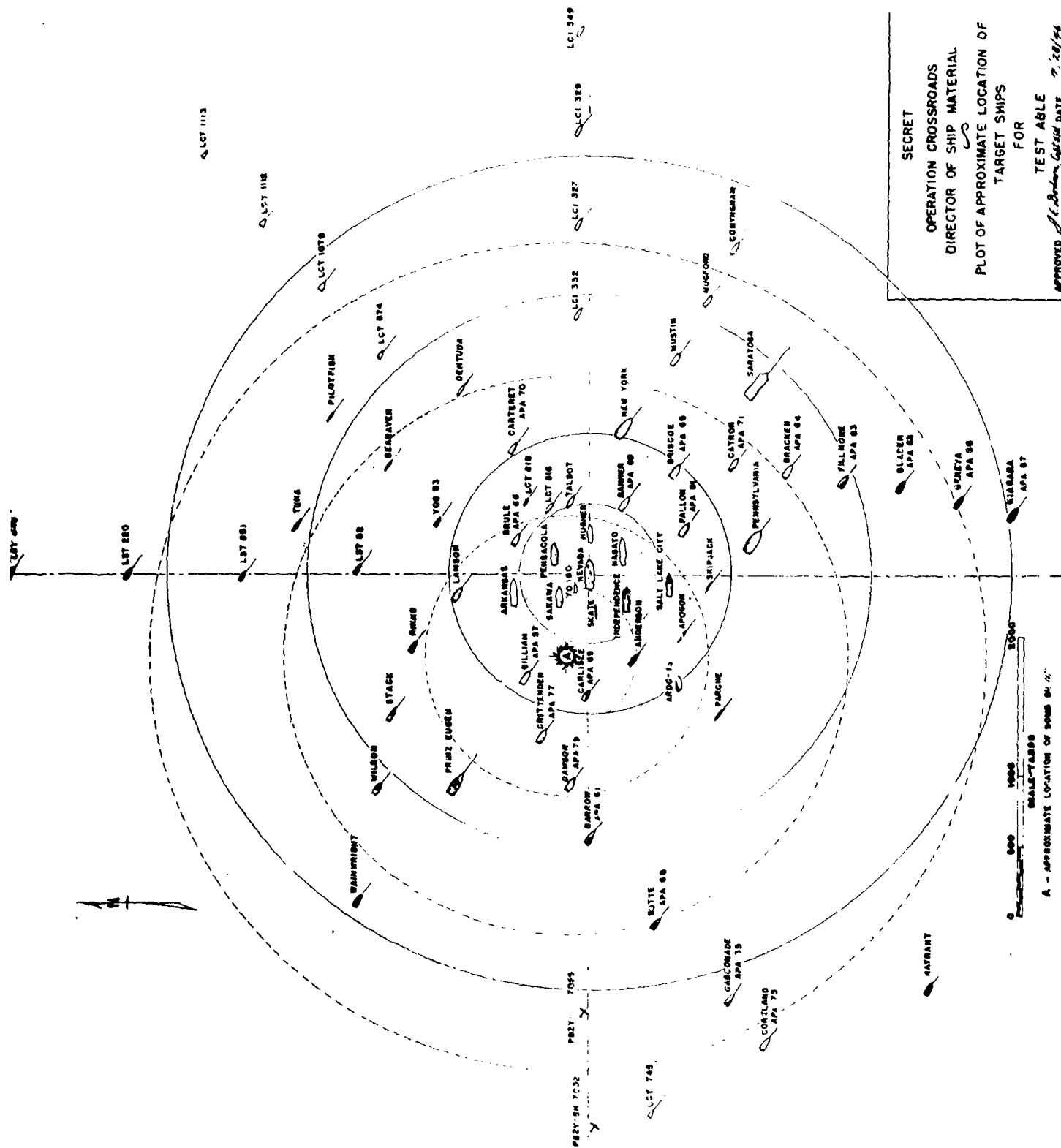
Target Array for Test "A"
Target Array for Test "B"
Mission of the Ordnance Material Group
Planning of the Ordnance Material Group

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SECRET
OPERATION CROSSROADS
DIRECTOR OF SHIP MATERIAL
PLOT OF APPROXIMATE LOCATION OF
TARGET SHIPS
FOR
TEST ABLE
APPROVED *[Signature]* DATE 7/28/44

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MISSION OF THE ORDNANCE MATERIAL GROUP

The general responsibility of the Bureau of Ordnance Material Group to the Director of Ship Material, Joint Task Force ONE and to the Bureau of Ordnance was to obtain all data possible concerning the effect of an atomic bomb explosion on ordnance equipment and systems and on the fighting efficiency from an ordnance standpoint of ships disposed about the target area at varying distances from the blast. The data obtained may be used for determining the changes necessary to ordnance equipment so that it will withstand blast, heat, shock and radioactivity resulting from the explosion of a nuclear fission bomb. The Bureau of Ordnance Material Group was specifically responsible for all matters pertaining to the planning, preparation, and coordination of activities concerned with material under the cognizance of the Bureau of Ordnance. The group was also solely responsible for the inspection, for the collection and assessment of data, for the analysis of results and preparation of reports concerning all phases of the atomic bomb effects on material under the cognizance of the Bureau of Ordnance. The group had a further responsibility to furnish liaison and technical advice and assistance to other associated groups on ordnance matters.

PLANNING

The types of ordnance to be included in the tests were limited in general to those installed in the ships selected for the target array. Most of the vessels selected for inclusion in the tests were scheduled for decommissioning or for inclusion in the inactive fleet. Therefore the most modern ordnance equipment had not been installed in the target vessels. In addition some items of the more modern ordnance equipment currently in demand for maintenance purposes were removed from the target vessels and insufficient quantities of certain equipments resulted in a lack of sufficiently wide distribution in the target array to provide complete data. Time was not available prior to test "A" to install the most modern equipment in the target vessels. Ordnance items of most recent design which were not represented include: Fire Control Radar Equipment, Mark 26 and 34, Gun Directors, Mark 38, 40, 54, etc. The construction of the items not included in the tests resembles in general, that of similar equipment in the vessels of the target array, therefore, comparisons will be possible based on the damage suffered by equipment of similar design.

To be of value, data on any damage caused by the atomic bomb explosion to ordnance (or other) equipment or material must be sufficiently precise to admit of accurate analysis. Visible damage can be accurately catalogued by trained observers but damage to functional efficiency may be more elusive. This hidden damage can be ascertained by measuring the operating efficiency of the instrument by various means and also by checking it against the previously recorded values for the same instrument. This type of test requires time and skilled operating personnel. The various units of the Bureau of Ordnance Material Group were instructed to devise standard inspection forms which would permit recording the exact condition of the equipment including its functional efficiency. These forms together with instructions for completing them were published in the "Red Book" (Instructions to Target Vessels Ordnance) which was distributed to all interested personnel and activities. In the instructions contained in the "Red Book"

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(Mission of The Ordnance Material Group, Continued)

--- considerable emphasis was placed on the fact that the "remarks" column of all the inspections forms was extremely important and that any unusual conditions of the equipment should be carefully noted in the remarks column if that condition could not be adequately covered in the form proper. Many thousands of the inspection forms illustrated in the "Red Book" were distributed to the target vessels.

It was early realized that the reduced complement of gunnery personnel in the target vessels would influence adversely the ability of the ship's forces to obtain complete and accurate data on the condition of ordnance items before and after the tests. Therefore, the Naval Shipyards at which the target vessels were being overhauled were instructed by the Bureau of Ordnance to obtain all possible data on battery alignment, condition of guns and mounts, etc. Representatives of the various units comprising the Bureau of Ordnance Material Group were sent to assist the several yards in the preparation of the target vessels for the tests.

In addition to instructing and assisting the crews of the target vessels in the completion of the ordnance forms this contact familiarized our personnel with the equipment in the target vessels so that subsequent inspections could be made quickly and efficiently. Assistance was given to the yards and to the target vessels in locating and installing special equipment and special munitions.

As far as possible it was desired to simulate actual service conditions of ordnance equipment. Consequently it was planned to have some equipment energized and operating during the tests. The plans for operating equipment were made to determine the relative susceptibility of operating and nonoperating equipments and therefore it was decided to energize and have in normal operating condition, at varying distances from the center of the array, all types of fire control systems and a number of gun mounts. The U.S.S. PENNSYLVANIA, U.S.S. PENSACOLA, U.S.S. WAINWRIGHT, U.S.S. PARCHE, U.S.S. SARATOGA, U.S.S. MUGFORD, U.S.S. WILSON, U.S.S. RHIND, U.S.S. RALPH TALBOT, U.S.S. BRACKEN, U.S.S. CORTLAND, U.S.S. CRITTENDEN, U.S.S. DAWSON, and U.S.S. ANDERSON were designated as operating ships. The amount of electrical power available was not sufficient in all cases to supply power for all systems so it was decided that where two systems in the same ship were identical one should be energized and one "secured". Thus comparable could be obtained. The following equipment was scheduled for operation in test "ABLE": Two Gun Directors Systems, Mark 37, One Gun Fire Control System, Mark 57, Two Gun Fire Control Systems, Mark 63, One Gun Director, Mark 34 System, Six Gun Directors, Mark 51, Two Gun Directors, Mark 33, Three Torpedo Directors, Mark 27, plus five 5 inch mounts and seven 40 MM mounts. The U.S.S. MUSTIN was substituted for the U.S.S. ANDERSON just prior to "ABLE" day due to a diesel generator casualty in the U.S.S. ANDERSON.

The U.S.S. SARATOGA, U.S.S. PENSACOLA, U.S.S. PENNSYLVANIA, U.S.S. WAINWRIGHT, and U.S.S. MUSTIN had one director system in each ship set up to maintain a constant relative bearing by means of a signal from the ship's master gyro compass. The relative bearing selected permitted the director and mounts to point at targets previously specified by the Electronic Coordinating Officer and the special groups.

The immediate preparation for test "ABLE" involved a rapid and comprehensive examination of the equipment on all target vessels. This was made by the personnel of the Ordnance Material Group just prior to test "ABLE" and definitely

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(Mission of The Ordnance Material Group, Continued)

--- established the condition of the equipment. Several errors in the reports by the ship's forces were found and corrected by these inspections.

The preparation for test "BAKER" was similar to that for test "ABLE" except that some equipment was damaged and could not be repaired with the facilities available.

Wherever possible equipment was repaired between tests and every effort was made to establish completely the condition of the equipment at the time of test "BAKER".

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S-E-C-R-E-T

Enclosure (D)

Subject: Bureau of Ordnance Material
Group Final Report for
Tests "A" and "B".

PART II

General Discussion
Conclusions and Recommendations

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GENERAL DISCUSSION

Test "A"

The above water detonation of the Atomic bomb in Test "A" did very little serious damage to the Ordnance Equipment on the target vessels. It is regrettable however, that the actual position of the bomb at detonation was so far from the planned position. The error in point of detonation of approximately 600 yards tended to nullify the carefully laid out distribution of ordnance equipment which was designed to give a complete gradation of damage to equipment. As a result the information obtained is not as complete as was originally intended.

The type of damage that did occur was of the type expected from blast and as all ordnance gear is designed to withstand gun blast, most of the damage was of a superficial nature. Directional effects were noted in that similar vessels equidistant from the explosion but different sectors received totally different amounts of damage. In considering this factual report of damage for design purposes it is well to keep in mind that while present equipment may withstand the forces of the present Atomic Bomb, future equipment must remain ahead of bomb development. Another factor which is present to a minor degree in the detailed damage sections is the damage caused by secondary fires on the target ships which occurred only because of displays of inflammable Army Quartermaster equipment.

The most serious material result of the explosion was the lack of ship's power for operating equipment on the ARKANSAS, NEVADA, INDEPENDENCE, SALT LAKE CITY, PENSACOLA, and HUGHES all of which were within about 900 yards of the explosion. The power failure reduced the fighting ability of these vessels to a minimum. It is noteworthy that the repair of this damage by the Bureau of Ships Machinery Unit within ten days greatly facilitated the inspections by this group and provides an indication of the length of time necessary before effective operation of ordnance equipment would be restored under emergency conditions of this nature.

The second most serious failure was the damage to radar antennae which greatly reduced the accuracy of the fire control systems concerned. The need for redesign of the radar antennae for greater strength is a primary result of test "A". It is noteworthy that modern rangefinders withstood this blast with no internal damage and accurate ranges were taken after the explosion without any repairs or adjustments. The retention of rangefinders and the continued stress on the training of rangefinder operators appears to be a natural conclusion.

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GENERAL DISCUSSION (Continued)

Navy ammunition which is the only type observed by this group, withstood the heat and blast without change except for dents due to blows against material objects. The armor and special treated steels show no effects as a result of Test "A".

Torpedoes, mines and depth charges were not detonated by the blast or heat of the bomb, but twelve torpedoes on the INDEPENDENCE either burned or were detonated low order by secondary fires. All torpedoes on the ANDERSON and LAMSON were located by divers and were found to be unexploded. Two of the ANDERSON's torpedoes were recovered for an analysis and this analysis showed no damage that could be attributed to the effects of the bomb detonation except that the guide stud was stripped in each torpedo.

The aviation ordnance material withstood the bomb effects better than the aircraft on which it was installed and therefore redesigning is not indicated at the present time.

The effect of the explosion on personnel is not a direct function of the Ordnance Material Group but it is considered very probable that the personnel would not withstand the effects of the atomic bomb air burst nearly as well as the ordnance material which has, in general, been demonstrated to be more resistant to the bomb effects than the platforms on which they are mounted.

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GENERAL DISCUSSION (Cont'd)

TEST "B"

The serious damage to ordnance equipment in test "B" was restricted to a distance of about 800 yards from the point of detonation except in the case of the NEW YORK and SALT LAKE CITY. The heavy equipment generally received more damage than the light or medium weight equipment. This damage to heavy equipment such as turrets, major caliber mounts, and directors is probably due to the fact that they are heavy and for that reason were not designed with sufficiently strong restraining devices to prevent upward motion. The shock from the underwater detonation was of sufficient force and in such a direction as to cause the heavy equipment to move vertically against the restraining devices, which proved inadequate. This is evident in the breaking of holding-down clips on the NEW YORK, NEVADA, PENSACOLA, and SALT LAKE CITY. The 5"/38 mounts on the HUGHES showed a similar effect in that the trunnion cap square holding bolts were stretched by the upward jar of the guns. It is extremely interesting to note that no light weapons were damaged beyond operability by test "B" and the only damage to intermediate caliber guns was in the HUGHES.

The fire control equipment received considerable damage on vessels within 700 yards of the bomb. The equipment on the HUGHES and PENSACOLA was almost completely inoperative but as the power plants on these vessels were badly damaged the fire control equipment would not have been of any value. The gunsights Mark 14 and 15 were generally not as severely damaged as in Test "A" but about 20 to 25% of the sights sustained damage principally from moisture and jammed ray filters.

Some gun directors on the HUGHES, PENSACOLA, SALT LAKE CITY, NEVADA, and NEW YORK received serious damage, while the Gun Directors Mark 37 on the PENNSYLVANIA received minor damage which would render the equipment inoperative for about two hours. The latter type damage is capable of correction by a minor redesign of the equipment. The light Gun Directors Mark 51 received some damage such as loss of sights and corrosion but generally sustained little serious damage.

The radar antennae damage was not as noticeable as in test "A" but this was partially due to the destruction of antennae in the early test and the shortage of replacements for test "B". The primary damage to radars was tube breakage. In general it can be stated that fire control radars more than 1500 yards from the detonation were undamaged while all those closer than 800 yards were completely inoperable.

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GENERAL DISCUSSION (Cont'd)

TEST "B"

The sharp line of demarcation between serious and minor damage to all ordnance equipment is illustrated by the HUGHES and MAYRANT. The former, which was about 200 yards closer to the bomb but in another sector from the latter, was reduced to a minimum fighting efficiency while the latter sustained only minor damage to ordnance equipment.

The ammunition withstood the test with practically no effects as no ammunition was burned or detonated. In fact, no ammunition was rendered unfit for usage by the direct action of the bomb. The shock played havoc with ammunition stowages within about 800 yards by displacing battens and stanchions and allowing the ammunition to jar from its stowage into large disorderly piles. Some 8"/55 powder tanks on the PENSACOLA were torn by the tossing about received from the explosion.

The underwater ordnance equipment in all vessels that remained afloat was inspected and subsequently analyzed. This equipment in general received little serious damage. Torpedoes on the HUGHES and some on the MAYRANT were shocked from their tubes but two of the torpedoes on the HUGHES were not thrown clear and remained hanging over the lip of the torpedo tubes. Subsequent analysis of the two torpedoes remaining in HUGHES revealed that they were badly damaged. A special weapon of the torpedo type was submerged on the deck of the APAGON. This weapon was recovered by divers and was found to be severely crushed and inoperative.

The aviation ordnance equipment again proved itself stronger than the airplanes on which it is used. The ships armor suffered no damage whatsoever.

The inspections were not as comprehensive as those made in test "A" due to the radioactivity. No power was available on most of the target vessels because personnel were not permitted to operate the necessary machinery due to the radiological dangers. Power from an external source was made available however during the inspections on certain important vessels. Furthermore, the ship's crews were not permitted sufficient time on board their ships to make complete inspections and as a result the completion of the ordnance inspection forms was not required but each vessel was required to submit a general summary of the condition of the ordnance material after test "B".

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GENERAL DISCUSSION (Cont'd)

TEST "B"

The inspections by the personnel of the Ordnance Material Group were made under difficulties as the radiological conditions of the vessels restricted their inspection time on any vessel to short periods. It must be understood that at the end of these short periods the personnel had received their daily tolerance of radioactivity and were prohibited from further inspections that day. Furthermore, the total time for inspection of all target vessels had to be held to a minimum to prevent exposure to insidious radioactive elements over extended periods.

Representative samples of damaged equipment were obtained for shipment to selected ordnance activities wherever possible for analysis. This was necessarily restricted by the fact that all topside equipment was more or less radioactive and required careful decontamination before shipment. For this reason the value of further analysis was carefully weighed in each case to determine if the data to be obtained were worth the risk involved.

The contamination of the vessels by radioactive materials necessitated that decontamination procedures be tried. These measures were improvised and by their nature were very detrimental to all topside ordnance equipment. The use of high pressure salt water streams and lye removed grease and paint thus permitting unrestricted corrosion. This might have been controlled if personnel had been able to reservice equipment but the radioactivity prevented any reboarding by ship's companies for this purpose. The lack of maintenance and excessive corrosion often made it impossible to distinguish between primary and secondary damage. It must be constantly borne in mind that effective decontamination measures against radioactivity will certainly be a necessary concomitant of future applications of atomic explosions. This is not a matter to be dismissed lightly but, rather, one of gravest concern from a military view point. A careful and thorough investigation of future decontamination measures should be made by the designers of ordnance equipment with a view toward the design of this equipment to withstand such measures.

This report is written entirely from the standpoint of Ordnance Material but the personnel problem is one of great importance and relates directly to the operability of ordnance equipment. It is considered likely that all personnel in the severely damaged vessels would have been killed or seriously injured by the shock throwing them against overheads and bulkheads. Furthermore, the radioactive material which contaminates the vessels would probably result in many fatalities. The probability of the ordnance material withstanding the atomic bomb in test "B" better than the operational personnel is just as great as it was in test "A".

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GENERAL DISCUSSION (Continued)

COMPARISON BETWEEN TESTS "A" AND "B"

The two tests were very different in their physical aspects and results. It is, therefore, difficult to find a sound basis for comparison. The following discussion covers all phases on which sufficient material is available to support a comparison.

Test "A" caused damage to topside ordnance equipment of a type which might be expected from an air burst, i.e. blast and wind damage, with shock and heat as secondary considerations insofar as their effect on ordnance equipment is concerned. The radioactivity did not affect the operability of ordnance equipment itself.

Primary damage was to topside ordnance equipment while below decks equipment sustained little or no damage, as blast and heat did not extend below decks and the equipment was sufficiently sturdy to withstand any shock transmitted to it through the ship's structure. While the qualities built into topside ordnance equipment to withstand ordinary gun blast undoubtedly were responsible for the remarkable resistance of such equipment to blast damage there was, in general, fairly extensive damage to the lighter ordnance equipment out to 1,000 yards and in some categories well beyond this range. Director and gun shields were badly dished-in, many gunsights Mark 14 and 15 were damaged, radar antennae and their supporting structures were demolished and a number of stable elements and light guns were rendered inoperative. From the observer's standpoint on initial inspection the damage appeared to be quite extensive, but detailed inspections and tests revealed that much less actual damage had occurred. A number of the foundations for the lighter guns and mounts were distorted in varying degree and it is consequently certain that battery misalignment resulted in some director controlled batteries. Enclosed directors and mounts, where the structure was light, presented a battered appearance but examination revealed that the enclosing structure protected the more delicate mechanisms housed therein. Wherever the blast, with its attendant high velocity and pressure, struck at the normal to a flat surface, was "pocketed", or was reflected against any surface, the structures generally gave way unless heavy armor was encountered. This phenomenon extended out to about 1,200 yards and out to 2,000 yards or more a tremendous force was exerted on large flat surfaces. The orientation of such surfaces to the direction of the center of detonation and the amount of shielding from adjacent structures had much to do with the amount of damage received.

Many open 5", 3" and 40 MM received only superficial damage, but unless shielding from adjacent superstructures was present the searing heat generally fried the grease on such mounts out to 1,000 yards, giving them a poor appearance. At such mounts the probable effect on personnel from blast and heat alone is obvious.

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GENERAL DISCUSSION (Continued)

COMPARISON BETWEEN TESTS "A" AND "B"

The instrumentation reports, particularly those of the Bureau of Ordnance, the Bureau of Ships, the Naval Medical Research and Radiological Safety Groups should be carefully studied in order to determine what probable effects on personnel would result from blast, heat and radioactivity at exposed ordnance locations. It is certain that even lightly shielded structures furnished very considerable protection from the blast and heat. It is probable that heavily armored structures furnished some protection from the direct initial bombardment of neutrons and gamma rays from the Test "A" burst.

Test "A" damaged equipment farther out in the target array than did Test "B" although this damage was primarily to topside equipment of the lighter type. Test "B" damaged equipment severely out to about 800 yards. This damage was primarily caused by the violent motion transmitted through the hulls of the vessels from underwater shock or from blows from the large weights of water which were a result of the waves created in the lagoon or from the descending water cascade. Of these factors, evidence supports the belief that the action of shock waves was by far the principal cause of damage.

It is interesting to note that in Test "B" there was a sharp band of demarcation of serious damage such as might be expected in the case of conventional underwater explosives where the force and resultant damage decreases sharply (approximately exponentially) as the distance from the center of the detonation increases. There appears to be a very narrow band about the center of explosion such that within the inner radius of the band very serious damage is experienced and outside the outer radius of the band little or no damage is experienced. Within this narrow band, the damage observed falls off with extreme sharpness from most serious damage to very minor damage. This band limiting the damage area appears to be determined by the stress at which failure of most vital shipboard material occurs.

There was negligible damage from the air blast that accompanied the underwater detonation. Heavy topside structures and below-decks equipment sustained the most damage in Test "B". Heavy director foundations and pedestals were thrown out of alignment within the serious-damage area and below deck ammunition stowages, including shell deck stowages of heavy projectiles, were torn loose and the ammunition was thrown about. Excluding those in the U.S.S. ARKANSAS and the U.S.S. SARATOGA, which ships were sunk, only one below-decks plotting room, in the U.S.S. HUGHES, was present within this area. The below-decks ordnance equipment in this vessel sustained considerable damage. While this is not sufficient evidence in itself to conclude that all below-decks plotting rooms in this area would be severely damaged, a study of the damage to Bureau of Ships below-decks equipment, would indicate that similar damage to below-decks ordnance equipment is a distinct probability.

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GENERAL DISCUSSION (Continued)

COMPARISON BETWEEN TESTS "A" AND "B"

Again in Test "B", there was no damage to ordnance equipment from radioactivity, but there was damage from the decontamination procedures employed and such damage must be taken into account in design if effective decontamination measures are devised. By far the most serious aspect of Test "B" is the probable effects of radioactivity on personnel. The radioactivity effects covered virtually the entire array and were not confined within a sharply defined area as would be the case of shock damage to personnel. While in Test "A" the radioactive effects may be described by the commonly used term "death ray", effective to a certain distance, the effects of Test "B" were more similar to a very persistent poisonous gas which has enveloped the ships. In the former case shielding will probably be very difficult from a practical ship-design standpoint, and a most careful study of the Naval Medical Research and Radiological Safety Group reports should be made to ascertain the extent of shielding required at various distances. In the latter case, while the instantaneous "ray" bombardment is shielded by the water, residual radioactivity ranging from highly dangerous to lethal was encountered on the ships and effective decontamination of topside areas would become immediately necessary. A study of the Naval Medical Report, the Radiological Safety Report and the Bureau of Ships Decontamination Report for effects on personnel as a result of Test "B" is also indicated.

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CONCLUSIONS AND RECOMMENDATIONS

It is concluded from Tests "A" and "B", two atomic explosions far exceeding any known application of conventional explosives in warfare, that redesign and strengthening of ordnance equipment, in common with other shipboard equipment, will be necessary to a degree which will withstand these explosions at a distance to be determined by the Chief of Naval Operations, having in mind the total strategical, tactical and material implications. It is further concluded that, unlike conventional explosives, which are generally localized in effect, these tests provided a basis of comparison of damage to ordnance equipment with damage to all other shipboard equipment and that on the basis of such total comparison the ordnance equipment stood up very well.

This is as it should be, for it is obvious that the repulsion of subsequent attacks, whether conventional or otherwise, will be necessary regardless of any other damage a ship receives. In fact, the strengthening of ship's power plants as well as director and gun foundations against air burst applications of the atomic bomb will be necessary to permit the remaining undamaged ordnance equipment to operate at greater than minimum efficiency and this is considered of primary importance.

From a design standpoint it is considered that the damage may be divided into two phases for both tests:

- (a) That which revealed weaknesses of certain equipment in comparison with all other ordnance equipment; such as radar antennae. In addition to this type or included within it, is that damage which relates closely to damage from conventional explosives. Thus, if a certain type of protection is needed for conventional explosives it follows that the Atomic explosions may accentuate the need for this feature. An example would be the case of protective shields, required against conventional explosives for protection from fragmentation and against atomic explosives for protection from blast, heat and radioactivity.
- (b) That type of damage in which all important shipboard components sustained damage, including ordnance equipment. Within this type should be included the total effects upon personnel and the design changes necessary to protect personnel. Redesign to meet this type of damage requires high echelon planning and coordination among the several material agencies to determine that radius from the center of detonation of present atomic explosives within which it is impracticable to pursue design changes without encroaching disproportionately upon present military characteristics of the vessels.

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CONCLUSIONS AND RECOMMENDATIONS. (CONTINUED)

Except for radioactivity and the most important ramifications of this new effect in warfare, the other phenomena of the atomic bomb explosions are those encountered in conventional explosives, but to a far greater degree. A mine for example, which detonated in very close proximity to a single ship could well cause material damage to a portion of that ship similar to that resulting from the atomic bomb, but the atomic bomb will cause such damage to all parts of many ships within a considerable area. Fragmentation, however, was not of significant importance in Tests "A" and "B".

It is finally concluded that radioactivity, which is lacking in conventional explosives, is such a new and important factor in its effect upon personnel, that it may well out-weigh, from a design standpoint, many of the present design considerations and practices. It is believed that radioactive effects and accompanying problems are undoubtedly the most important finding of the test and too much stress cannot be placed on the need for study and experimentation to counteract this factor. The above is true although radioactivity did not directly affect ordnance material.

Accordingly it is recommended that:

- (1) Weaknesses in present design, as discussed in this report, be corrected as soon as practicable, wherever such correction does not involve complete redesign of major equipment.
- (2) Prior to undertaking any major redesign, all design, medical, strategical and tactical agencies concerned should confer in order to establish a minimum distance from the point of atomic detonation beyond which all important shipboard equipment and personnel are to be protected and to remain operative. When this distance is established, the redesign of equipment should be undertaken in close collaboration among the several design agencies. The data in this and other parts of the Joint Task Force report should be used as a basis for such changes as may be indicated.
- (3) As a result of Test "B", a program be instituted to study shock, shock mountings and shock resistant materials to minimize this type of damage.

Specific recommendations concerning the various types of ordnance equipment are included in their appropriate section of this report.

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Enclosure (D)

Subject:

Bureau of Ordnance Material
Group Final Report for
Tests "A" and "B".

PART III - INSTRUMENTATION

General Discussion
Planning
Conclusions and Recommendations

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TEST "A"

GENERAL DISCUSSION

The Atomic bomb air burst produced an explosion similar to that which would be expected from the detonation of 20,000 tons of TNT. This similarity applies to the total energy released in terms of heat, light and kinetic energy, but this similarity doesn't necessarily apply to pressures, shock waves and general destructive effects as the explosion rates and the mass of the explosives are greatly dissimilar. The radiological effects of the fission bomb air burst on target vessels is much less evident than the effects from the underwater explosion. This is due to the fact that all fission products and other radioactive material from the air burst were carried aloft by the air current and dissipated over a large area. The initial radiation which accompanied the explosions, however, was much greater from the air burst than from the underwater burst due to the shielding effect of the water in the latter case.

PRESSURES:

Peak pressures encountered in the air blast were in the range of 2000 psi near the center of the burst and fell off rapidly in the first few hundred yards to below 100 psi. At the outer edge of the target array, peak pressures were from 1 to 3 psi. The peak pressures had a duration of from 1/2 second near the center of the burst to 1 second at the outer edge of the array. The peak pressures fell off rapidly and dropped off to below atmospheric pressure in a little more than a second.

WIND VELOCITIES:

Wind velocities up to 100 miles per hour were encountered near the center of the blast but dropped off to about 10 miles per hour near the outer edge of the target array.

TEST "B"

The underwater atomic bomb explosion produced effects which might be similar to the simultaneous explosion of 15,000 tons of TNT below the water and 5,000 tons of TNT at the surface of the water. A column of water roughly 2,000 feet in diameter was thrown to over 5,000 feet altitude. The explosion was accompanied by the development of a cloud containing radioactive particles, which enveloped the entire array. Radioactive effects from the underwater explosion were extremely marked. The high residual radioactivity of the targets may be attributed to the fact that the fission products were held in the column of water thrown up by the explosion, which then fell back on many of the target vessels and deposited these products on the target ships and to the absorption of radioactive material by water in the lagoon.

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TEST "B"

PRESSURES

Air peak pressures in Test "B" were considerably less than those encountered in Test "A", amounting to 15 psi at a few hundred yards from the center of the burst and dropping to 1 psi near the outer edge of the array. Such peak pressures had a time duration similar to that of the pressures encountered in Test "A", namely 1/2 second. Water peak pressures encountered in Test "B" approached 7000 psi at mid depth and 5000 psi at the surface within 1000 yards of the point of detonation. Surface and mid depth pressures fell off to less than 400 psi at the outer edge of the array and were approximately equal. Water peak pressures were of a duration of less than a millisecond and dropped off to near zero in a few milliseconds.

WIND VELOCITIES

Wind velocities in Test "B" were less than those encountered in Test "A", however exact ratios are not available at this time.

It is regretted that a more detailed account of the physical effects of the fission bomb explosions cannot be portrayed in this report but all exact data on the resulting physical phenomena are the express function of the Instrumentation Groups and will be included in their reports which will be of higher classification. It is significant, however, that of the effects noted, all except one, radioactivity, are those normally encountered in the use of conventional explosives, but of much higher magnitude.

The radioactivity, is a new and extremely serious problem which cannot be minimized due to its effect on personnel. The tests have demonstrated that radioactivity had no effect on ordnance material but its effect on operating personnel requires that it be fully studied in correlation with blast, shock, and other effects in connection with the design of ordnance equipment. The study should particularly include an analysis of the effects of radioactivity on the animals placed in the target vessels. It is believed that an interesting comparison may be made of the effects on animals in ordnance locations at various distances from the center of detonation and the measurement of radioactivity in similar locations. Some deduction as to the effect of shielding from heavy and light armor at various distances may then be possible from such a study.

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TEST "A"

INSTRUMENTATION

PLANNING

It was early understood that complete and accurate instrumentation of ordnance equipment and areas essential to the stowage, handling or operation of ordnance equipment would be necessary to analyze the results of the test effectively. Instrumentation data had to be gathered for direct correlation with the damage observed after the atomic detonations and for application to changes in ordnance design and operation.

The Bureau of Ordnance Material Group, however, possessed no instruments of its own and was not responsible for the design, installation, or operation of any instruments. Phenomena such as shock, acceleration, blast, static pressure, temperature, and gamma ray and neutron density were anticipated and a record of their value at ordnance locations was of primary interest. To cover the instrumentation needs of the Group, a close liaison was maintained with the various Instrumentation Groups which were procuring data which would be applicable to ordnance material.

The respective instrumentation groups were requested to make measurement of blast, acceleration, temperature and radiation at approximately one hundred ordnance locations selected by the Ordnance Material Group. Time-intensity information was requested in preference to peak readings.

BLAST MEASUREMENTS

The Air Blast Committee agreed to supply the Ordnance Material Group with one hundred foilmeter gauges, provided this group would be responsible for the location of the foil pots. The Air Blast Committee agreed to install the foil, read the gauges, and evaluate the results.

The foilmeter is essentially a cylindrical pot covered by a double face plate, perforated by a set of holes of various diameters. Between the two plates is an aluminum foil. The foil stretched across a given hole bursts under a certain blast pressure, which must be greater for holes of smaller size. It is a peak reading air blast indicator.

Gauge pots were installed at Pearl Harbor and Terminal Island by Ordnance Material Group Personnel in one hundred and two locations. Nine-five of these pots were foiled at Bikini prior to Test "A", the remainder being unfoiled due to lack of the special type of compartmented face plates required for internal locations.

Six of these gauges, none of which were in entirely sealed locations, gave significant readings in the ABLB Test.

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TEST "A"

BLAST MEASUREMENTS
(Cont'd)

Twenty-three of these pots were refoiled for measurement of blast in Test "B". All of those refoiled were on vessels close to the center of the array where sufficient blast to give readings at internal gauges was expected.

The Air Blast Committee also had available a number of Free Piston Gauges to measure blast, and agreed to place three at internal ordnance locations but due to the difficulty of installation and the pressure of work, only one was installed.

Measurement of shock and blast at five locations (gun shields and turret tops) was also requested of the Air Blast Committee and the Committee placed at each of these locations four foil gauges and two groups of five crusher gauges.

TEMPERATURE MEASUREMENTS

The Bureau of Ships Instrumentation Group agreed to furnish temperature paint specimens at all the locations requested and plaques of temperature pellets at representative locations. The temperature paint shows definite changes of color depending on the maximum temperature to which it is subjected.

The Ordnance Material Group, to relieve the Bureau of Ships Instrumentation Group of the burden of distributing paint to many locations, obtained small metal plates on which the paints were applied. Two-hundred thirty-three of these plates were distributed by the Ordnance Material Group. The Bureau of Ships Instrumentation Group distributed temperature pellets and temperature paint at numerous locations as well.

After Test "A", of the temperature plates recovered, sixty-seven showed sufficient change to warrant further analysis and all of these plates were in exposed locations. Final analysis of all temperature measurements will be included in the Bureau of Ships Instrumentation Group report.

Thirty-seven of the temperature plates were specially distributed by the Ordnance Material Group for Test "B".

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TEST "A"

RADIOACTIVITY MEASUREMENTS

The Radiological Safety Group furnished packets as described below, which were distributed at more than two-hundred ordnance locations for Test "A", and one-hundred locations for Test "B". Each packet contained one casualty film badge, one personnel film badge, a sulphur pellet and a phosphorous pellet. The film gives a measure of gamma radiation dosages while the pellets measure neutron dosages.

Distribution and collection of these packets were handled by the Radiological Safety Group and the evaluations of the films and pellets will be made and reported in the report of the Radiological Safety Group.

To obtain further information concerning radiation density at ordnance locations, twenty-five lead piles were distributed by the Naval Medical Research Group. Film, buried in various depths of lead, give an indication of the radiation density. The lead piles were built by the Naval Medical Group at the suggestion of the Ordnance Material Group.

STATIC PRESSURE MEASUREMENTS

To obtain information concerning static pressure at ordnance locations, a list of thirty-nine locations was submitted to the Bureau of Ships Instrumentation Group requesting installation of static pressure gauges. The Bureau of Ships Instrumentation Group agreed to install as many as could be spared up to forty and to read and analyze the data.

Thirty-four peak pressure gauges, three pressure time cylinders, and one pressure time recorder were placed at seventeen different ordnance locations for Test "B". Collection and analysis of this data will be accomplished and reported by the Bureau of Ships Instrumentation Group.

ACCELEROMETER MEASUREMENTS

To determine accelerations experienced by ordnance equipment the Ordnance Material Group initiated, through the Bureau of Ships Instrumentation Group and the Naval Research Laboratory, a design of a peak-reading accelerometer. This instrument measures peak acceleration by indenting an aluminum sample with a hardened steel point. The diameter of the indentation is a measure of the acceleration.

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TEST "A"

ACCELEROMETER MEASUREMENTS
(Cont'd)

With the close cooperation of the Bureau of Ships Instrumentation Group, the Naval Torpedo Station, Alexandria, Va. built fifty of these gauges. Locations were chosen with technical advice of the Bureau of Ships representatives and base plates were located by the Ordnance Group at Pearl Harbor and Bikini.

Forty-one accelerometers were located for Test "A" and forty-four accelerometers for Test "B". For the second test several old locations were eliminated and new ones added. The changes were made to obtain more information below decks where the accelerations were expected to be of major significance.

The aluminum samples from these accelerometers were collected by the Bureau of Ships Instrumentation Group and the results will be included in their report.

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TEST "A" LOCATIONS OF PEAK
PRESSURE AND PRESSURE TIME RECORDERS

BB-33 USS ARKANSAS	
Circle deck, No. 2 Turret	Both positive pressure and vacuum gages.
Handling room, No. 6 Turret	Positive pressure gage reinforced mount.
Gun chamber, No. 3 Turret	Positive reinforced.
BB-36 USS NEVADA	
Handling room, No. 2 Turret	Positive and vacuum gages.
IX-300 PRINZ EUGEN	
Gun chamber, Turret B	Positive reinforced.
Projectile handling room platform.	Positive.
BR-34 USS NEW YORK	
Gun chamber, No. 3 Turret	Positive reinforced.
Handling room, No. 3 Turret	Positive.
DD-410 USS HUGHES	
Small arms armory	Two positive gages.
DD-413 USS MUSTIN	
No. 2 Mount	Positive and vacuum, both reinforced.
DD-411 USS L. NWRIGHT	
No. 2 Mount	Positive and vacuum, both reinforced.
Ammunition handling room	Positive.
BB-38 USS PENNSYLVANIA	
Magazine	Positive.
Gun room, No. 1 Turret	Positive reinforced.
Handling room, No. 7 5"/38	Positive.
Gun Director, Mk. 37, Port	Positive reinforced.
Gun Director, Mk. 34, No. 2	Positive.
CA-25 USS SALT LAKE CITY	
Handling room	Positive.
BB(JAP) NAGATO	
Gun chamber, No. 1 Turret	Positive reinforced.
CV-3 USS SARATOGA	
Gun mount 5"/38 No. 5	Positive reinforced.
Gun Director Mk. 37	Positive reinforced.
Handling room, 5"/38 No. 6	Two positive gages.
Handling room, 5"/38 No. 7	Positive.
SS-305 USS SKATE	
Forward torpedo room	Positive reinforced.

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TEST "A" LOCATIONS OF PEAK
PRESSURE AND PRESSURE TIME RECORDERS
(Cont'd)

APA-63 USS BLADEN
No. 2 Cargo hold

Two positive gages.

APA-87 USS NIAGARA
No. 2 Cargo hold

Two positive gages.

DD-404 USS RHIND
Handling Room No. 4

Pressure time recorder.

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TEST "A" LOCATION OF ACCELEROMETERS

CA-24 USS PENNSACOLA	Mk. 63 CPCS; base underneath Mk. 51 director, port side. Mk. 33 director rangefinder U bracket. Base of Mk. 33 director. Mk. 51 director on deck on braces stbd on shell tray # 1 turret (also one near shell tray # 1 turret)
CA-25 USS SALT LAKE CITY	Near shell tray # 1 turret. On shell tray # 1 turret. Mk. 33 director base. Mk. 33 director inside on frame. Mk. 51 director aft underneath on brace.
BB-38 USS PENNSYLVANIA	5"/38 twin mount inside on deck. Mk. 34 gun director top of director. Mk. 37 director top of shield. Mk. 37 director right of control officer.
BB-36 USS NEVADA	14"/45 turret shell tray; # 2 turret.
DD-408 USS WILSON	5"/38 base aft (two) Base of Mk. 51 port gun director (40 MM). Underside of stbd 40 MM gun platform. Main deck over beam just inboard of base of port torpedo tube. Deck beside port and stbd Mk. 27 torpedo tube (two). On NRL bracket in Mk. 33 main battery director. Deck beside armored tube just below Mk. 33 Director.
DD-404 USS RHIND	After brace, armored tube main director Mk. 37 NRL bracket Mk. 37 director. Crossbraces port side Mk. 37 director. Torpedo director foundation port side. Torpedo racks port side outboard. Underneath Mk. 51 director starboard. Starboard 40 MM and Port 40 MM (two). After 5"/38 turret.
DD-390 USS RALPH TALBOT	Outside wing of base of Mk. 33 director. Underneath base of Mk. 51 director forward of bridge. Beside base of torpedo director Mk. 37 stbd. wing of signal bridge. U bracket of Mk. 33 director port side.

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TEST "A" LOCATIONS OF ACCELEROMETERS
(Cont'd)

DD-411 USS ANDERSON	Large I beam inside Mk. 37 director. Base of torpedo director Mk. 37 forward, of bridge. Base of starboard 40 MM Mount. Base of # 3 gun aft.
APA-57 USS GILLIAM	# 2 hold.
APA-63 USS BLADEN	Frame 109, weather deck.
DD-367 USS LAMSON	Inside #1-5" Mount.
DD-390 USS RALPH TALBOT	Inside #1-5" Magazine.
DD-389 USS MUGFORD	Inside #1-5" Magazine.
DD-410 USS HUGHES	Inside Gun Director Mk. 37.
DD-404 USS RHIND	Inside #2-5" Handling Room.
CVL-22 USS INDEPENDENCE	Central Stbd. Hangar Deck. Forward Magazine.
BR-36 USS NEVADA	Inside # 1 Turret. Inside # 1 Magazine. Gun Director Mk. 37 inside shield. Inside 5"/38 Twin Mount.
BR-38 USS PENNSYLVANIA	Inside # 1 Turret Magazine. Inside # 2 Turret 14"/35. Inside Aft Port 5"/38 Twin Mount. Gunfire Control System Mk. 63 - Internal Mk. 51 Ped. Inside Forward Stbd. Twin Mount 5"/38.
CA-25 USS SALT LAKE CITY	Inside # 1 Turret. Inside # 1 Magazine.
USS LST 661	On Deck.
SS-305 USS SKATE	Conning Tower. Forward Torpedo Room.
SS-384 USS PARCHE	Cigarette Deck. Conning Tower, Control Room.

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TEST "A" LOCATIONS FOR MEASUREMENT OF RADIOACTIVITY

APA-60 USS BANNER	On deck, hold or magazine.
APA-61 USS BARROW	On deck, hold or magazine.
APA-63 USS BLADEN	On deck, hold or magazine.
APA-64 USS BRACKEN	On deck, hold or magazine.
APA-65 USS BRISCOE	On deck, hold or magazine.
APA-66 USS BRULE	On deck, hold or magazine.
APA-68 USS BUTTE	On deck, hold or magazine.
APA-70 USS CARTERET	On deck, hold or magazine.
APA-71 USS CATRON	On deck, hold or magazine.
APA-73 USS CLEBURNE	On deck, hold or magazine.
APA-77 USS CRITTENDEN	On deck, hold or magazine.
APA-83 USS FILLMORE	On deck, hold or magazine.
APA-87 USS NIAGARA	On deck, hold or magazine.
DD-367 USS LAMSON	Deck amidships, #1-5" mount, Handling room, magazine, main deck fantail. Mines and depth charges, main deck fantail, torpedo exploders, torpedo shacks, torpedo detonators, main deck stowage, torpedo, center line tube superdeck.
DD-368 USS FLUSSER	Deck amidships, #1-5" mount, handling room, magazine, mines and depth charges, main deck fantail, torpedo detonators, main deck stowage, torpedo forward centerline tube superdeck.
DD-371 USS CONYNGHAM	Deck amidships, #1-5" mount, handling room, magazine, mines and depth charges, main deck fantail, torpedo exploders, torpedo shacks, torpedo detonators, main deck stowage, torpedo, forward centerline tube superdeck.
DD-389 USS MUGFORD	Deck amidships, #1-5" mount, handling room, magazine, mines and depth charges, main deck fantail, torpedo exploders, torpedo shacks, 40 mm mount, near after mount, torpedo detonators, main deck stowage, torpedo, after starboard.

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TEST "A" LOCATIONS FOR MEASUREMENT OF RADIOACTIVITY

DD-390 USS RALPH TALBOT Deck amidship, #1-5" mount, handling room, magazine, mines and depth charges, main deck fantail, torpedo exploders, torpedo shacks, 40 mm mount near after mount, torpedo detonators, main deck stowage, torpedo, after stbd. tube main deck.

DD-404 USS RHIND Deck amidship, #1-5" mount, handling room, magazine, mines and depth charges, main deck fantail, torpedo exploders, torpedo shacks, 40 mm mount near after mount, torpedo detonators, main deck stowage, torpedo, after stbd. tube main deck.

DD-410 USS HUGHES Gun Director, Mk. 37 outside director shield, gun director Mk. 37 inside director Mk. 51, beside Mk 14 sight, torpedo director Mk. 27, beside director.

DD-411 USS ANDERSON Gun Director Mk. 37, outside director shield, Gun Director Mk. 37, inside director, Gun Director Mk. 51, beside Mk. 14 sight, torpedo director Mk. 27, beside director.

DD-413 USS MUSTIN Deck amidship, #1-5" mount, inside handling room magazine, Gun Director Mk. 37, outside director Gun Director Mk. 37, inside director, Gun Director Mk. 51 beside Mk. 14 gun sight, Gun Director Mk. 51 beside Mk. 14 gun sight, torpedo director Mk. 27 beside director, mines and depth charges, on main deck fantail, torpedo exploders, torpedo shacks, torpedo detonators, normal maindeck stowage, torpedo, forward C.L. tube superdeck.

DD-419 USS WAINWRIGHT Gun Director Mk. 37, outside director shield, Gun Director Mk. 37, inside director shield, Gun Director Mk. 51 beside Mk. 14 sight, torpedo director Mk. 27, beside director.

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TEST "A" LOCATIONS FOR MEASUREMENT OF RADIOACTIVITY
(Cont'd)

CV-3 USS SARATOGA

Forward magazine central stbd. hangar deck
amidships flight deck, Gun Director, Mk. 37
outside director shield, Gun Director Mk.
37 other system-outside director shield, Gun
Director, Mk. 37 inside director shield, Gun
Director, Mk. 37 inside director shield, Gun
Director, Mk. 51 8 systems, beside gun sight,
#1-5"/38 twin mount, inside mount beside guns,
Torpedo loaded in Flight Deck, Torpedoes,
Stowage compartment 3 planes - Stack on flight
deck, Rockets, forward hangar deck aft hangar
deck.

CVL-22 USS INDEPENDENCE

3 planes on flight deck, Rockets, stack on
flight deck forward hangar deck, forward
magazine, hangar deck, forward magazine, Central
Stbd. hangar deck, Amidships flight deck, Torpedo
loaded in flight deck, torpedoes, Stowage deck.

BB-34 USS NEW YORK

#1 Turret, inside magazine handling room,
plane, top # 3 turret.

BB-36 USS NEVADA

#1 Turret, inside magazine handling room near
catapult.

BB-36 USS ARKANSAS

#1 Turret, inside magazine handling room near
catapult.

BB-38 USS PENNSYLVANIA

#1 Turret, inside magazine handling room near
catapult, Gun Director Mk. 54 outside director
shield. Gun Director, Mk. 34 inside director
shield. Gun Director, Mk. 37 outside director
shield. Gun Director, Mk. 37 inside director
shield. Gun Director, Mk. 51, Mod. 3 beside
Gunsight. Gun Director, Mk. 51 beside gun sight,
(other system). Gun Director, Mk. 51, third
system beside gun sight. Gun Director, Mk. 63
external of Gun Director, Mk. 51 Pedestal. Gun
Director, Mk. 63 (other system) external of Gun
Director, Mk. 51 pedestal. Gun directors, Mk.
63 (both systems) internal of Gun Director, Mk.
51 pedestal. Turret 14"/35 #2 inside turret over
trays. Turret #3 14"/35 inside turret over trays.
Twin Mount 5"/38 forward, starboard inside.

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TEST "A" LOCATIONS FOR MEASUREMENT OF RADIOACTIVITY

CA-24 USS PENSACOLA	Magazine Handling Room - Gun Director, Mk. 51 beside gun sight. Gun Sight Mk. 14 (4 systems) beside gunsight. Gun Fire Control Systems external of Mk. 51. Mk. 63 (2 systems) pedestal. Gun Fire Control Systems internal of Mk. 51 Mk. 63 (2 systems) pedestal. #1 Turret 8"/55 over trays in mounts. #1 Turret 8"/55 outside near mounts. #4 Turret 8"/55 over trays in mounts. #4 Turret 8"/55 outside near mounts. Plane on catapult.
CA-25 USS SALT LAKE CITY	#1 Turret inside Magazine Handling Room. Plane on catapult.
IX-300 PRINZ EUGEN	Turret #1 Main Deck inside handling room.
BB-Jap NAGATO	#1 Turret on Main Deck beside Turret.
USS LST 52	On Deck.
USS LST 661	On Deck.
USS LST 220	On Deck.
USS LST 545	On Deck.
SS-308 USS APAGON	5" Mount - Near Mount - Torpedoes - Bridge - Cigarette Deck - Conning Tower - Forward Torpedo Room - Muzzle of Open Stern Tube.
SS-335 USS DENTUDA	5" Mount - Near Mount - Torpedoes - Bridge - Cigarette Deck - Conning Tower - Forward Torpedo Room - Stern Torpedo Room - Muzzle of Open Stern Tube.
SS-305 USS SKATE	5" Mount - Near Mount - Torpedo - Bridge - Cigarette Deck - Conning Tower - Forward Room - Stern Room.
SS-384 USS PARCHE	5" Mount - Near Mount - Torpedo - Bridge - Cigarette Deck - Conning Tower - Forward Room - Stern Room.

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TEST "A" LOCATIONS FOR MEASUREMENT OF RADIOACTIVITY

SS-386 USS PILOTFISH	5" Mount - Near Mount - Torpedo - Bridge - Cigarette Deck - Conning Tower - Forward Room - Stern Room.
SS-384 USS SKIPJACK	Torpedoes - Forward Room - Stern Room .
SS-203 USS TUNA	Torpedoes - Forward Room - Stern Room.

TOTAL:

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LIST OF TEST "A" INSTALLATIONS OF LEAD FILES

APA-57 USS GILLIAM	# 2 hold.
APA-63 USS BLADEN	Frame 109, weather deck.
DD-367 USS LAMSON	Inside #1-5" Mount.
DD-390 USS RALPH TALBOT	Inside #1-5" Magazine.
DD-389 USS MUGFORD	Inside #1-5" Magazine.
DD-410 USS HUGHES	Inside Gun Director Mk. 37.
DD-404 USS RHINO	Inside #2-5" handling room.
CVL-22 USS INDEPENDENCE	Central stbd. hangar deck. Forward Magazine.
BB-36 USS NEVADA	Inside # 1 Turret. Inside # 1 Magazine. Gun Director Mk. 37 inside shield. Inside 5"/38 Twin Mount.
BB-38 USS PENNSYLVANIA	Inside # 1 Turret Magazine. Inside # 2 Turret 14"/35. Inside Aft Port 5"/38 Twin Mount. Gunfire Control System Mk. 63 - Internal Mk. 51 Pedestal. Inside fwd. stbd. Twin Mount 5"/38.
CA-25 USS SALT LAKE CITY	Inside # 1 Turret. Inside # 1 Magazine.
USS LST 661	On Deck.
SS-305 USS SKATE	Conning Tower. Forward Torpedo Room.
SS-384 USS PARCHE	Cigarette Deck. Conning Tower, Control Room.

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TEST "B" LOCATIONS OF PEAK PRESSURE,
PRESSURE TIME RECORDERS AND PRESSURE
TIME CYLINDERS

DD-413 USS MUSTIN Gun Director, inside.	Vacuum gauge and positive gauge, both reinforced.
DD-404 USS RHIND Gun Director, inside. Handling Room # 4.	Vacuum and positive gauges, both reinforced. Pressure Time Recorder.
IX-300 PRINZ EUGEN Gun Room, Turret B.	Vacuum and positive gauges, both reinforced.
BB-34 USS NEW YORK No. 5 Gun Chamber. Plane on deck port side.	Positive Reinforced gauge. Pressure time cylinder.
BB-36 USS NEVADA Stbd 5" Gun, frame 82. Turret # 2, officer's booth. Stbd 5" Gun, frame 56	Positive reinforced gauges. Positive reinforced gauge. Positive reinforced gauge.
BB-33 USS ARKANSAS Gun Chamber, Turret # 2.	Vacuum and positive gauges, both reinforced.
CV-3 USS SARATOGA No. 5 Gun Mount Plane TBM-3E on flight deck Torpedo racks, hangar deck, frame 189.	Positive reinforced. Pressure Time Cylinder. Pressure Time Cylinder.
BB-Jap NAGATO Gun Chamber Turret No. 4 Gun Turret No. 4, frame 252	Two positive gauges. Pressure Time Cylinder.
BB-38 USS PENNSYLVANIA Turret # 4, officer's booth. Forward main battery director. After main battery director.	Two positive gauges. Vacuum and positive gauge. Positive gauge.
TOTAL: 20 Peak Pressure Gauges. 3 Pressure Time Cylinders. 1 Pressure Time Recorder.	Total: 17 Locations.

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TEST "B" LOCATIONS OF ACCELEROMETERS

DD-408 USS WILSON 5"/38 Base Aft (two).
Base of Mk. 51 port Gun Director (40 MM).
Underside of Stbd. 40 MM gun platform.
Main deck over beam just inboard of base of
port torpedo tube.
Deck beside port and stbd. Mk. 27 torpedo
Tube (two).
On BRL bracket in Mk. 33 Main Battery Director.
Deck beside armored tube just below Mk. 33.

DD-404 USS RHIND After brace, armored tube main director Mk. 27.
NRL bracket Mk. 37 Director.
Crossbrace port side Mk. 37 Director.
Torpedo Director foundation port side.
Torpedo racks port side outboard.
Underneath Mk. 51 Director starboard.
Starboard 40 MM and port 40 MM (Two).
After 5"/38 Turret.

DD-390 USS RALPH TALBOT Outside wing of base of Mk. 33 director.
Underneath base of Mk. 51 Director forward of
bridge.
Beside base of torpedo director Mk. 27 stbd.
wing of signal bridge.
U bracket of Mk. 33 director port side.

CV-3 USS SARATOGA # 1 Turret on gun trunnion 5"/38 stbd. fwd.
Mk. 51 Director on yoke; port amidships.
Inside forward Mk. 37 director frame.

CA-24 USS PENSACOLA Mk. 63 CFC3; base underneath Mk. 51 Director,
port side.
Base of Mk. 33 Director.
Mk. 51 Director on deck on braces, stbd.
On shell tray # 1 Turret.
Frame 19, A-507-A, rib in front door, stbd.
side of hull (radar spaces).
Mk. 33 Director rangefinder U bracket.
Frame 21, second deck, A-203-IL, port side of
barbette # 1 turret.

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TEST "B" LOCATIONS OF ACCELEROMETERS

CA-25 USS SALT LAKE CITY On shell tray # 1 Turret.
Mk. 33 Director Base, inside on frame.
Mk. 51 Director Aft, underneath on brace.
A-511 3/4-M, frame 27, brace fwd. bulkhead.
Door to shell deck, turret # 1, 1st. platform
fr. 26, A-308-L.

BB-36 USS NEVADA 5"/38 Twin mount inside on deck.
14"/45 Turret shell tray, # 2 turret.

BB-38 USS PENNSYLVANIA 5"/38 Twin mount inside on deck.
Mk. 34 Gun Director, top of director.
Mk. 37 Director, right of control officer.
Main deck, frame 82, on overhead I beam,
frame 82 stbd. side, 15 feet inboard.
On frame 82, 3rd deck overhead, I beam,
ammunition passageway.

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TEST "B" LOCATIONS FOR MEASUREMENT OF RADIOACTIVITY

APA-60 USS BANNER	# 2 hold, first platform.
APA-81 USS BARROW	# 2 hold, first platform.
APA-63 USS BLADEN	On Deck.
APA-65 USS BRISCOE	# 2 hold, first platform.
APA-66 USS BRULE	# 2 hold, first platform.
APA-70 USS CARTWRIGHT	# 2 hold, first platform.
APA-77 USS CRITTENDEN	# 2 hold, first platform.
DD-402 USS MAYRANT	# 1 5" Mount, frame 32. # 1 handling room. # 1 Magazine, frame 37.
DD-371 USS CONYNGHAM	Same as DD-402.
DD-389 USS MUGFORD	# 1 5" Mount, frame 32. # 1 handling room. # 1 magazine. Torpedo shacks, frame 121. 40 MM Mount.
DD-360 USS RALPH TALBOT	Same as DD-389.
DD-404 USS RHIND	Same as DD-389.
DD-410 USS HUGHES	Inside Gun Director Mk. 27, frame 60.
DD-413 USS MUSTIN	# 1 5" Mount, Frame 30. # 1 handling room, frame 25. # 1 magazine, frame 37. Inside Gun Director Mk. 27. Torpedo shacks, frame 105. Torpedo director, Mk. 27.
DD-419 USS WAINWRIGHT	Same as DD-413.

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TEST "B" LOCATIONS FOR MEASUREMENT OF RADIOACTIVITY

CV-3 USS SARATOGA	Forward magazine, frame 65. Control Stbd. Hangar Deck. Inside forward Mk. 37 Director, frame 77. Inside after Mk. 37 Director, frame 120. Torpedo stowage compartment, frame 139.
BB-34 USS NEW YORK	# 1 Turret. # 1 Magazine. # 1 Handling Room.
BB-36 USS NEVADA	Same as BB-34.
BB-33 USS ARKANSAS	Same as BB-34.
BB-38 USS PENNSYLVANIA	# 1 Turret Inside. # 1 Magazine Inside, A-421-M. # 1 Handling Room. Inside Gun Director Mk. 34. Inside Gun Director Mk. 37. Inside # 2, 14"/35 Turret. Inside # 3, 14"/35 Turret. Inside aft port twin 5"/38. Inside forward stbd. twin 5"/38.
CA-24 USS PENSACOLA	# 1 Magazine, A-411-N, frame 22. # 1 Handling room, frame 22. Beside Gun Director Mk. 51. # 1 Turret 8"/55, frame 22. # 4 Turret 8"/55, frame 118.
CA-26 USS SALT LAKE CITY	# 1 Turret. # 1 Magazine. # 1 Handling room.
IX-300 USS PRINZ EUGEN	"B" Turret, inside. "B" Handling room, inside, frame 147.
SS-308 USS APAGON	Forward Torpedo Room. Stern Torpedo Room. Conning Tower. Bridge.

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TEST "B" LOCATIONS FOR MEASUREMENT OF RADIOACTIVITY

SS-335 USS DENTUDA	Same as SS-308.
SS-305 USS SKATE	Same as SS-308.
SS-384 USS PARCHE	Same as SS-308.
SS-386 USS PILOTFISH	Same as SS-308.
SS-184 USS SKIPJACK	Same as SS-308.
SS-203 USS TUNA	Same as SS-308.

TOTAL: 103.

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CONCLUSIONS AND RECOMMENDATIONS

The Instrumentation program requested by the Bureau of Ordnance Material Group in various ordnance locations was instigated with the foreknowledge that such information would be vitally necessary to design planning for future ordnance equipment and in re-designing present ordnance equipment to better withstand the effects of a near-by atomic bomb detonation.

It is concluded from test results that the instrumentation data will be of prime importance in regard to the following design aspects:

1. To prepare specifications for improved design where such is necessary because of damage results contained in this report.
2. For comparison with similar data on exterior locations to determine the extent of re-design necessary in purely ordnance locations - e.g. a light gun shield which partially collapsed, damaging minor interior equipment, might be considered adversely in comparison to a near-by open mount which sustained no damage but which was subject to high blast pressures and heat sufficient to "fry" the grease thereon. However, instrumentation would undoubtedly reveal that personnel at the open mount would suffer casualties from blast and heat, whereas those inside the lightly shielded mount would have been largely protected.
3. For determining the relative protection to personnel from all types of radio activity provided by the various degrees of shielding afforded in interior ordnance locations thus pointing the way in future protection of operating gunnery personnel.
4. For determining what shock mountings or shock absorbing strength is required in all types of ordnance equipment.
5. For determining the shape and contour of ordnance equipment necessary to withstand the blast pressures encountered and to prevent pocketing of radioactive material.
6. For determining that radius in horizontal distance from the center of both types of atomic bomb detonation within which it is impractical to further strengthen ordnance and other equipment due to weight factors and the law of diminishing returns and, thus, further determining the tactical distance between vessels in atom bomb defense formations.
7. To provide a basis for design coordination between the Bureau of Ordnance and other vitally interested bureaus and design activities.
8. To point the way to improved metallurgical and material studies, now required for future ordnance design.

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Enclosure (D)

Subject: Bureau of Ordnance Material
Group Final Report for
Tests "A" and "B".

PART IV - EXPLOSIVES

Planning
Preliminary Preparations
Ship Preparations
Details of Ammunition, Loading and Placement
Ship Inspection
Results of Test "A"
Results of Test "B"
General Conclusions

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A. General.

1. Planning.

The Ammunition and Explosives Research Section of the Bureau of Ordnance in anticipation of the approval of Operation CROSSROADS began laying plans for the test of explosives during the early days of January, 1946. Early in January, 1946, each of the Ammunition Research Sub-Sections of the Bureau of Ordnance was asked to make known its suggestions for material and equipment under its cognizance with a list of recommended ammunition and explosive items to be tested in Operation CROSSROADS.

The initial plans for exposing explosives to the atomic bomb were prepared by members of the High Explosives Research Sub-Section of the Bureau of Ordnance, in February, 1946, with the aid of the sub-sections on Powder, Projectiles, Propellants and Fuzes.

The initial plans specified the loading of a limited number of vessels with samples of the newer developments in munitions. Specially loaded projectiles with inert loads and live fuzes were to be provided by the Bureau of Ordnance. In this manner the effect of the Atomic Bomb on Fuzes would not be masked by the detonation of a large high explosive charge. This Bureau was also to provide munitions loaded with high explosives but containing no fuzes.

The munitions loaded with high explosives (loaded and plugged) would test the sensitivity of the filler, without being dependent upon the action of the more sensitive fuzes.

Originally a limited number of each class of material was to be placed in selected ships, so that the vessels would not be endangered by mass detonation of large amounts of ammunition normally contained therein. The newer types of projectiles, rockets, propellants, explosives and fuzes were to be tested in this manner.

After the initial plans were prepared covering many types of ammunition, a conference was held with representatives of Army Ordnance, Army Chemical Warfare Service and Army Engineers. It was found that considerable duplication existed, and therefore, the lists of these groups were compared and those items which were of mutual interest were assigned to one group. This coordination permitted a greater variety of explosives to be tested and prevented duplication.

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1. Planning (Cont'd).

When the target ship array for Test "A" was determined it was decided that the high explosive items unfuzed, loaded and plugged, would be exposed in the holds, in the magazines, in the ready service lockers and certain items on deck in target vessels ranging from the center of the array to the periphery. In this way the effects of the Atomic Bomb would be obtained at varying distances, and under varying conditions of shielding. Similarly other target vessels were selected to carry the blind (plaster) loaded and fuzed items. These vessels were selected also to give a graded series of distances from the point of detonation of the Atomic Bomb.

The decision by the Joint Chiefs of Staff (February, 1946) to include service ammunition in quantities from 10% to 100% of the war-time allowance, occasioned some change of plans relative to placement of the special test ammunition. However by placing the test ammunition aboard in locations other than those occupied by the service loads, it was believed possible to secure the data necessary for the evaluation of the effects of the Atomic Bomb on these newer types of ammunition.

Later, on arrival at Bikini, it was found that certain of the ships previously selected for special high explosives were also being used as instrumentation ships. In order not to endanger the delicate instruments, the bombs (L & P) were removed and placed on board other ships which carried fewer instruments. In the rearrangement the series of distances from the center of the array were maintained so that graded effects could be studied.

2. Preliminary Preparation.

After the Unit was completely organized it was temporarily divided into several groups and these were sent severally to Terminal Island, Port Chicago, San Francisco, California, and Pearl Harbor, T.H., to aid in obtaining and shipping to the target vessels the service and special ammunition required for Operation CROSSROADS. The representatives of the Explosives Unit acted also as representatives of all Units of the Ordnance Material Group at the above named Naval Stations.

At Port Chicago the U.S.S. ARTEMIS (AKA-21) was loaded with special Navy and Army Ammunition. Part of this ammunition was delivered to the target vessels at Pearl Harbor, T.H. On the arrival of the ARTEMIS at Bikini she was used as an ammunition stores ship and as a collecting point for Navy ammunition and fuzes selected to be returned to the United States for special tests.

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2. Preliminary Preparation (Cont'd).

In order to provide information of a character useful to the Initial Boarding Teams, salvage tugs and fire-fighting parties, the Unit prepared detailed ammunition lay-out plans. These plans showed the location in each target vessel of all Army and Navy ammunition and explosives. These plans were of particular value to the Initial Boarding Teams for inspection of the target vessels after both Tests ALAN and BAKER.

3. Ship Preparation.

When vessels were assigned to the Target Vessel Group by the Chief of Naval Operations, the Commanding Officers of the vessels were instructed to adjust their war time allowance of ammunition to the assigned percentage, i.e., from 10% to 100% as specified by higher authority.

The task of these ammunition transfers was accomplished by the Ship's force at the nearest naval ammunition depot, the greatest load being secured from the Naval Ammunition Depot at Seal Beach, California while the larger target vessels were based at Terminal Island.

On instruction from the Bureau of Ordnance the ships were issued "fleet returns" ammunition to fill out their assigned complement of service ammunition. This ammunition had been returned to the ammunition depots by various vessels at the end of hostilities. This ammunition was composed of mixed lots of service rounds all of which were in excellent condition, from a stability and stowage safety standpoint, but which were not approved by the Bureau of Ordnance for firing since the history and lot numbers were not well known. By use of this ammunition the Bureau of Ordnance was able to test service rounds without expending large amounts of new and expensive materials.

Prior to departure for Bikini, while in West Coast Ports or Pearl Harbor, T.H., the target vessels were placed in readiness for the display of various special test munitions.

Special Test Munitions as outlined below were delivered to vessels upon arrival in Pearl Harbor, T.H. except for a few vessels which were assigned special operational duties and delaying the delivery of some special munitions until they reached the Bikini Area. These remnant deliveries were small token amounts consequently, no delays were encountered.

Special Aerial bombs, aerial mines, aerial torpedoes, Jet Assist take-off Units, and floating mines, were secured to the target ships by 3/8 inch diameter special plow steel wire straps and 1/2 inch pad eyes welded to the decks. Various lengths of wire straps were prepared and the necessary welding of pad eyes was accomplished by the Naval Shipyard, Pearl Harbor.

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3. Ship Preparation (Cont'd).

Aircraft rocket heads, and ship's armament munitions were stowed in the normal stowage in the ammunition handling train. On the SARATOGA and the NAGATO special Test Aviation Munitions were displayed on the topsides, both assembled and unassembled.

The Commanding Officers of Target Vessels or their Gunnery Representatives were thoroughly acquainted with applicable CROSSROADS Forms and every assistance to the vessels was given where necessary. On ships having no competent aviation or mine personnel, munitions were cared for and prepared by members of the Ordnance Material Group.

Prior to Test "A" and to Test "B", last minute inspections of displayed ammunition were made to ascertain complete readiness.

3a. Details of Ammunition Loadings and Placement.

The loading of ammunition and explosives aboard target vessels was divided into two phases.

- (a) 10 to 100% wartime service allowance of ammunition was loaded into target vessels as directed by the Commander, Joint Task Force ONE. Service allowance ammunition was loaded in both magazine and ready service stowage in the percentages shown under each vessel's loading list.
- (b) Special test ammunition and explosives, were placed so as to determine the effect of the tests on this class of material from a design standpoint. This ammunition was placed aboard vessels at the request of the Navy Bureau of Ordnance.

Ammunition as used herein includes depth charges, mines, torpedoes, bombs, pyrotechnics, and rockets as well as gun ammunition. In general, the older types of material and fleet returns were used to fill the service allowances. Newer types were in general, represented in the special test items. Since many identical ammunition items are used by both services, the (A-N) series of items were tested only by one service in order to prevent duplication.

Reports on Ammunition and Chemical Warfare items which were placed on test by the Army Groups are not included in this report. Reports on these items are being prepared by the appropriate Army Groups and these reports should be consulted as necessary.

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LOADING DETAILS: Given below is a loading list for those vessels which carried Navy Ammunition and Explosive items. Each list is subdivided as follows:

- (a) Service Allowance: by percentage wartime service allowance, not by individual item.
- (b) Special Test Ammunition:- Navy Items Only.

(c) Type: BATTLESHIPS

(1) U.S.S. ARKANSAS (BB-33)

Test "A" - 400 yards.

Test "B" - 300 yards. (SUNK)

(A) 50% Service Allowance of Ammunition.

(B) Special Test Ammunition.

1. Navy Items.

One Airplane (VOS) loaded with 1 100 lb G.P. bomb BL (Fuzing: AN-M103A1 Nose, AN-M100A2 Tail) and 10 rounds - 30 cal. per gun.

8 - proj, 12"/50, A.P., L & P, 4 each turret # 1 and # 3.

8 - proj, 12"/50, A.P. BL (Fuzing: MK21-1 BDF) 4 each turret # 2 and # 4.

32 - proj, 12"/50, H.C., L & P, 16 each turret # 1 and # 3.

12 - proj, 12"/50, H.C., BL (Fuzing: MK48-1 BDF, MK29-3 P.D.F., MK 55 - 0 A.D.F.) 6 each turret # 2 and # 4.

80 - proj, 5"/51, H.C., L & P, 20 Fwd. stbd. mount, 20 Aft stbd. mount, 20 Fwd. port mount, 20 Aft port mount.

40 - proj, 5"/51, H.C. BL (Fuzing: MK29-3 PDF, MK23-15 P.D.F.) 20 each center casemate port and starboard.

5 - Charges, powder, 12"/50, (SPCG 8823) Red, turret # 4.

20 - Charges, powder, 5"/51 (SPCG 8823) Mount # 4.

24 - Fuzes, Mech Time, proj, MK50, shell deck turret # 2.

24 - Fuzes, point detonating, proj. MK29-3, Shell deck, turret # 2.

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(2) U.S.S. NEW YORK (BB-34)

Test "A" - 1900 yards.

Test "B" - 1200 yards.

(A) 10% Service Allowance of Ammunition.

(B) Special Test Ammunition.

1. Navy Items:

One Airplane (VOS) loaded with 1 - 100 lb G.P. bomb, BL (Fuzing: AN-MK219 Mod 3 Nose, M-115 Tail) and 10 rounds - 30 cal. per gun.
8 - proj. 14"/45, A.P., L & P 4 each turret #1 and #3.

8 - proj. 14"/45, A.P. BL (Fuzing: MK21-1 B.D.F.) 4 each turret #2 and #4.

32 - proj. 14"/45, H.C., L & P, 16 each turret #1 and #3.

12 - proj. 14"/45, H.C., BL (Fuzing: MK48-1 B.D.F., MK29-3 P.D.F.), MK55-0 A.D.F.) 6 each turret #2 and #4.

5 - Charges, powder, 14"/45, (20 bags), (SPCG 8823) Red, turret #4.

40 - proj. 5"/51, BL (Fuzing: MK29-3 P.D.F., MK54-0 A.D.F., MK28-15 B.D.F.), 20 each center casemate port and starboard.

80 - proj. 5"/51, L & P, 20 each of 4 mounts, Forward Stbd, Forward port, Aft Stbd, Aft Port.

20 - Charges, powder, 5"/51, (SPCG 8823) Red - Mount # 4.

24 Fuzes, Mech Time, proj, MK 50, Shell deck turret #2.

24 Fuzes, point detonating, proj, MK 29-3, shell deck turret #2.

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(3) U.S.S. NEVADA (BB-36)

Test "A" - 600 yards.

Test "B" - 1000 yards.

(A) 66 2/3% Service Allowance of Ammunition.

(B) Special Test Ammunition.

1. Navy Items.

One Airplane (VOS) loaded with 1 - 100 lb
G.P. bomb, BL (Fuzing: AN-M103A1 Nose,
AN-M100A2 Tail) and 10 rounds - 30 cal.
per gun.

8 - proj. 14"/45, A.P., L & P, 4 each
turret #1 and #3.

8 - proj. 14"/45, A.P., BL (Fuzing: MK 21-1
B.D.F.) 4 each turret #2 and #4.

32 - proj. 14"/45, H.C., L & P, 16 each
turret #1 and #3.

12 - proj. 14"/45, H.C., BL (Fuzing: MK 48-1
B.D.F., MK55-0, A.D.F., Mk 29-3 P.D.F.) 6
each turret #2 and #4.

5 - Charges, powder, 14"/45, (SPCG 8823)
(20 bags) turret #4.

80 - proj. 5"/38, AAC, L & P, 20 each of
4 mounts, forward starboard, forward port,
Aft Starboard, Aft Port.

70 - proj. 5"/38, AAC, BL (Fuzing: MK 50
M.T.F., MK 28-15 B.D.F.) 15 each mount,
forward stbd, aft port.

15 - proj. 5"/38, AAC, BL (Fuzing: MK53,
VT, MK 28-15 B.D.F.) 8 Forward starboard
mount, 17 Aft port mount.

20 - Charges, powder, 5"/38, (SPCG 8823)
Aft Stbd mount.

24 - Fuzes, Mech Time, proj. MK 50, shell
deck turret #2.

24 - Fuzes, point detonating, proj. MK 29-3,
shell deck turret #2.

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(4) U.S.S. PENNSYLVANIA (BB-39)

Test "A" - 1800 yards.

Test "B" - 1200 yards.

(A) 50% Service Allowance of Ammunition.

(B) Special Test Ammunition.

1. Navy Items:

Two Airplanes (V-17) each loaded with

1 - 100 lb G.P. bomb, BL (Fuzing: AN-MK 219-3/AN-M103A1 Nose, M 115 - AN-M100A2, Tail/Respectively).

8 - proj, 14"/45 A.P., BL (Fuzing: MK21-1 B.D.F.) 4 each turret #2 and #3.

8 - proj, 14"/45, A.P., L & P, 16 each turret #1 and #3.

32 - proj, 14"/45, H.C., L & P, 16 each turret #1 and #3.

12 - proj, 14"/45, H.C., B.L. (Fuzing: MK 42-1, B.D.F., MK 55-0 A.D.F., MK 29-3 P.D.F.) 6 each turret #2 and #3.

5 - Charges, powder, 14"/45, (SPCG 8823) Red, (20 bags), turret #3.

80 - proj, 5"/38, AAC, L & P, 20 each of 4 mounts, forward stbd, forward port, Aft stbd, Aft port.

30 - proj, 5"/38, AAC, BL (Fuzing: MK 50 MTF, MK 28-15 B.D.F.) 15 each mount forward stbd, aft port.

15 - proj, 5"/38, AAC, BL (Fuzing: MK 53 VT, MK28-15 B.D.F.) 8 forward stbd mount, 7 aft port mount.

24 - Fuzes, Mech Time, proj, MK 50, shell deck turret #2.

24 - Fuzes, point detonating, proj, MK 29-3 shell deck turret #2.

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(d) Type: CARRIERS

(1) U.S.S. SARATOGA (CV-3)

Test "A" - 2700 yards.

Test "B" - 500 yards. (SUNK)

(A) 66 2/3% Service Allowance of Ammunition.

(B) Special Test Ammunition.

1. Navy Items.

6 - Rockets, 5."0, HVAR, Assembled, inert, (Fuzing: Mk 6 heads, Mk 149 Nose, Mk 164 Base) flight deck fr. 25 port.

8 - Rockets, 5."0, HVAR, Assembled, inert, (Fuzing: Mk 149 nose, Mk 164 base), on stbd V.F., Flight Deck.

6 - Heads, Rocket, 5."0, Inert (Fuzing: Mk 149 nose, Mk 164 base), hgr. deck, fr. 164 stbd.

1 - Rocket, 11."75, Assembled, Inert, (Fuzing: 3 Mk 157 base) Flight deck port V.F.

5 - Rockets, 11."75, Assembled, Inert, (Fuzing: 3 Mk 157 base) Flight deck, fr. 63, port.

5 - Bombs, G.P., 500#. Inert, (Fuzing: AN-M 243 Nose, AN-MK 230 Mod 6 Tail) Hgr. deck, fr. 80 - 82 stbd.

8 - Bombs, A.D.B. 350#, Inert, (Fuzing: AN-M102A1 Nose, AN-MK 230 Mod 6 Tail) Flight deck, fr. 30 - 40 Port.

7 - Bombs, A.D.B., 350#, Inert, (Fuzing: AN-MK 219 Mod 3 Nose, AN-MK 230 Mod 6 Tail), Hgr. deck, fr. 80 - 82, port.

3 - Mines, Aerial, MK 24, Inert 1 - VTB flight deck, 1 - Hgr. deck fr. 164 port, 1 - Mezzanine deck.

3 - Torpedoes, Mk. 13 & Mods, Inert, live detonator, 1 - VSB flight deck, 1 mezzanine deck, 1 magazines.

8 - Aircraft with 10 rounds of Ammo per gun, Flight deck.

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(d) Type: CARRIERS

(1) U.S.S. SARATOGA (CV-3) (Cont'd).

Test "A" - 2700 yards.

Test "B" - 500 yards. (SUNK)

4 - Rockets, 11."75, Assembled, Inert
(Fuzing: 3 Mk 157 base). Hgr. deck fr.
165 stbd.
1 - Bomb, G.P., 500#, Inert, (Fuzing:
AN - M103A1 Nose, AN - M102A2 Tail) Flight
Deck, VTB Port.
1 - Bomb, G.P., 500#, Inert, (Fuzing:
AN-M103A1 Nose, M 116 Tail) Flight deck,
VTB Port.
1 - Bomb, G.P., 500#, Inert, (Fuzing:
AN-M103A1 Nose, AN-M101A2 Tail) Flight
deck, VSB stbd.
1 - Bomb, G.P., 500#, Inert, (Fuzing:
AN-M103A1 Nose, M 116 Tail) Flight deck,
VSB stbd.
3 - bombs, G.P., 500#, Inert, (Fuzing:
AN - M103A1 Nose, AN - M101A2 Tail) Flight
deck, fr. 59 - 61, stbd.
3 - Bombs, G.P., 500#, Inert, (Fuzing:
AN - M103A1 Nose, M 116 Tail) Flight Deck,
Fr. 59 - 61 stbd.
6 - Aircraft with 10 rounds of Ammo per gun,
Hgr. deck.
40 - Proj., 5"/38, AAC, L & P., 20 each
mount forward and aft.
15 - Proj., 5"/38, AAC, BL (Fuzing: MK 50 MTF,
MK 28-15 B.D.F.) forward mount.
5 - Proj., 5"/38, AAC, BL, (Fuzing: MK 53 VT,
MK 28-15 B.D.F.) forward mount.

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(d) Type: CARRIERS

(2) U.S.S. INDEPENDENCE (CVL-22)

Test "A" - 700 yards.

Test "B" - 1200 yards.

(A) 66 2/3% Service Allowance of Ammunition.

(B) Special Test Ammunition.

1. Navy Items:

3 - Mk 13 Torpedoes complete, inert except live detonator. 1 - VSB Flight Deck.

1 - Hgr. Deck. 1 - Torpedo stowage, Hgr. Deck.

3 - Mk 24 Mines, inert except live detonator.

1 - VTB Flight Deck. 1 - Hgr. Deck.

1 - Magazine.

8 - Aircraft with 10 rounds of ammo. per gun, Flight Deck.

6 - Aircraft with 10 rounds of ammo. per gun, Hangar Deck.

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(e) Type: CRUISERS

(1) U.S.S. PENSACOLA (CA-24)

Test "A" - 600 yards.

Test "B" - 700 yards.

(A) 66 2/3% Service Allowance of Ammunition.

(B) Special Test Ammunition.

1. Navy Items:

One Airplane (VOS) loaded with 1 - 100 lb. general purpose bomb (BL) fuizing: AN-M103A1 nose and M100A2 Tail; and 10 rounds 30 cal. per gun.

10 - Proj., 8"/55, A.P., loaded and plugged, turret #1.

8 - Proj., 8"/55, BL, (Fuizing: Mk21-1 BDF 4 each turret #2 and #4.

30 - Proj., 8"/55, H.C., loaded and plugged, 15 each turret #1 and #3.

12 - Proj., 8"/55, H.C., BL (Fuizing: MK48-0 BDF; MK55-0 ADF; MK29-3 PDF), 6 each turret #2 and #4.

10 - Charges powder, 8"/55, SPEC 3023, (red) turret #4.

80 - Proj., 5"/25, AAC, loaded and plugged, 40 each mount, forward stbd. After port.

30 - Proj., 5"/25, AAC, BL, (Fuizing: MK50 MTF; MK54-0 A.D.F.; MK28-15 B.D.F.), stbd aft mount.

10 - Proj., 5"/25, AAC, BL, (Fuizing MK 53 VTNF; MK 54-0 A.D.F.; MK 28-15 B.D.F.), stbd aft mount.

24 - Fuzes, proj., Mechanical Time, (1 box) MK 50-0, shell deck turret #2.

24 - Fuzes, proj., Point Detonating, (1 box), MK 29-3, shell deck turret #2.

(2) U.S.S. SALT LAKE CITY (CA-25)

Test "A" - 1000 yards.

Test "B" - 1200 yards.

(A) 10% Service Allowance of Ammunition.

(B) Special Test Ammunition.

1. Navy Items:

(All items identical to U.S.S. PENSACOLA with addition as follows:)

1 - Guided Missile, STV, "BUMBLEBEE", inert, Boat Deck, port, fr. 115.

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(f) Type: DESTROYERS

- (1) U.S.S. STACK (DD-406) U.S.S. ANDERSON (DD-411)
Test "A" - 1200 yards. Test "A" - 600 yards. (SUNK)
Test "B" - 1800 yards.
(A) 100% Service Allowance of Ammunition.
(B) Special Test Ammunition: None.
- (2) U.S.S. HUGHES (DD-410)
Test "A" - 800 yards.
Test "B" - 800 yards.
(A) 66 2/3% Service Allowance of Ammunition.
(B) Special Test Ammunition: None.
- (3) U.S.S. MAYRANT (DD-402) U.S.S. WAINWRIGHT (DD-419)
Test "A" - 3600 yards. Test "A" - 2200 yards.
Test "B" - 800 yards. Test "B" - 2800 yards.
(A) 50% Service Allowance of Ammunition.
(B) Special Test Items: None.
- (4) U.S.S. WILSON (DD-408)
Test "A" - 1600 yards.
Test "B" - 1500 yards.
(A) 50% Service Allowance of Ammunition.
(B) Special Test Ammunition:
 1. Navy Items:
 - 2 - Torpedoes, Mk. 27, special inert.
 - 1 - Torpedo Mk. 27, inert, fantail.
 - 1 - Torpedo Exploder Mk. 10-3, torpedo shack.
 - 1 - Torpedo Exploder Mk. 6-5, torpedo shack.
 - 3 - Torpedo Detonators Mk. 7, normal stowage.
 - 3 - Torpedo Detonators Mk. 9, normal stowage, separate from Mk. 7.
 - 1 - Torpedo Booster Mk. 2, magazine space.

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(5) U.S.S. LAMSON (DD-367) U.S.S. CONYNGHAM (DD-371)
Test "A" - 900 yards. Test "A" - 3100 yards.
(SUNK) Test "B" - 3500 yards.

U.S.S. RHIND (DD-404)

Test "A" - 1000 yards.

Test "B" - 2200 yards.

(A) 50% Service Allowance of Ammunition.

(B) Special Test Ammunition:

1. Navy Items:

- 2 - Torpedoes, Mk. 15 - Mod 3 Special Inert Tube 1 (L & R)
- 1 - Torpedo, Mk. 27, Inert, fantail port side, Main deck.
- 1 - Torpedo exploder, Mk 3-5, Torpedo Shack main deck (LAMSON fr. 190)(RHIND - CONYNGHAM fr. 120).
- 1 - Torpedo exploder, Mk. 10-3, torpedo shack main deck (LAMSON fr. 190)(RHIND - CONYNGHAM fr. 120).
- 1 - Torpedo booster, Mk. 2, small arms locker (LAMSON A-204-A, fr. 36)(CONYNGHAM D-308-M, fr. 175)(RHIND C-311 $\frac{1}{2}$, fr. 185).
- 3 - Torpedo detonators, Mk. 9, port and stbd side main deck under aft deck house overhead. (CONYNGHAM P&S main deck galley Passage Way fr. 61).
- 3 - Torpedo detonators, Mk. 7 (LAMSON under 20 Mt Moun' P&S side fr. 90)(CONYNGHAM under bridge fr. 61) main deck galley (RHIND Det. stowage fr. 65, port side).
- 80 - Proj., 5"/38 AAC, loaded and plugged, Mount #1.
- 20 - Proj., 5"/38, AAC, BL (Fuzing: MK 50 MTF; MK. 28-15 BDF) Mount #2.
- 15 - Proj., 5"/38, AAC, BL, (Fuzing: MK 53 VTNF; MK. 28-15 BDF) Mount #2.
- 40 - Proj., 5"/38 WP Loaded, Mount #4.
- 20 - Charges, Powder, 5"/38, SPCG 8823, Mount #3.
- 1 - Depth Chg., Mk. 6, Inert, (Live Booster & Det) Fantail Rack.
- 1 - Depth Chg., Mk. 8, Inert, (Live Booster & Det) Fantail Rack.
- 6 - Depth Chgs., Mk. 9, Inert, (Live Booster & Det) Fantail Rack.
- 1 - Depth Chg. MK. 14, Inert, (Live Booster & Det) Fantail Rack.

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(6) U.S.S. TRIPPE (DD-403) U.S.S. MUGFORD (DD-389)
Test "A" Test "A" - 2900 yards.
Test "B" - 1200 yards. Test "B" - 2500 yards.

U.S.S. RALPH TALBOT (DD-390)
Test "A" - 1200 yards.
Test "B" - 1700 yards.

(A) 10% Service Allowance of Ammunition.
(B) Special Test Ammunition.

1. Navy Items:

- 2 - Torpedoes, Mk. 15 Mod. 3, Special Inert (TRIPPE Tube 1 L&R)(MUGFORD-RALPH TALBOT tube 3 L&R).
- 1 - Torpedo Mk. 27, Inert, fantail, port side.
- 1 - Torpedo exploder Mk. 6-5 (MUGFORD torpedo shack, fr. 130)(RALPH TALBOT torpedo shack, fr. 120).
- 1 - Torpedo exploder Mk. 10-3 (MUGFORD torpedo shack, fr. 130)(RALPH TALBOT torpedo shack, fr. 120).
- 3 - Torpedo detonators, Mk. 7 (MUGFORD rig stowage, fr. 67 - 70)(RALPH TALBOT det. stowage, fr. 66).
- 3 - Torpedo detonators, Mk. 9 (MUGFORD No. 3 handling room, fr. 140)(RALPH TALBOT det. stowage, fr. 66).
- 1 - Torpedo booster, MK. 2 (MUGFORD small arms locker D-207-M, fr. 173)(RALPH TALBOT small arms C-D-309, fr. 175).
- 60 - Proj., 5"/38, AAC, Loaded and Plugged, Mount #1.
- 20 - Proj., 5"/38, AAC, BL, (Fuzing: MK 50 MTF; MK. 28-15 BDF) Mount #4.
- 15 - Proj. 5"/38, AAC, BL, (Fuzing: MK 53 VTNF; MK 28-15 BDF), Mount # 4.
- 30 - Proj. 5"/38, WP Loaded, Mount #1.
- 15 - Chgs. Powder, 5"/38, SPCG 8823, Mount #1.
- 1 - Depth Chg. Mk. 6, Inert, (Live Booster & Det), Fantail Rack.
- 1 - Depth Chg. Mk. 8, Inert, (Live Booster & Det), Fantail Rack.
- 6 - Depth Chgs, MK 9, Inert, (Live Boosters & Det's), Fantail Rack.
- 1 - Depth Chg, Mk. 14, Inert, (Live Booster & Det), Fantail Rack.

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(7) U.S.S. MUSTIN (DD-413)

Test "A" - 2400 yards.

Test "B" - 1500 yards.

(A) 10% Service Allowance of Ammunition.

(B) Special Test Ammunition.

1. Navy Items:

- 60 - Proj. 5"/38, AAC, Loaded and Plugged, Mount #1.
- 25 - Proj. 5"/38, AAC, BL, (Fuzing: MK. 50 MTF "K. 28-15 BDF), Mount #4.
- 30 - Proj. 5"/38 WP Loaded, Mount #2.
- 15 - Charges, Powder, 5"/38, SPCG 8823, Mount #1.
- 1 - Depth Chg. MK 6, Inert, (Live Booster & Det), Fantail Rack.
- 1 - Depth Chg. Mk. 8, Inert, (Live Booster & Det), Fantail Rack.
- 6 - Depth Chgs, Mk. 9, Inert, (Live Booster & Det), Fantail Rack.
- 1 - Depth Chg. Mk. 14, Inert, (Live Booster & Det), Fantail Rack.
- 1 - Smoke Tank, (unfilled).

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(g) Foreign Ships:

1. PRINZ EUGEN

Test "A" - 1000 yards.

Test "B" - 1800 yards.

(A) Service Allowance.

8" projectiles and powder.

Turrets 1, 2, 3, 4.

4.1" Fixed Rounds Port & Starboard, Amid ships Magazine.

(Total ammunition approximately 63% war time load of 8" and 4.1").

(B) Special Test Ammunition:- None.

2. NAGATO

Test "A" - 900 yards.

Test "B" - 700 yards. (SUNK)

(A) Service Allowance Japanese.

16.1" Projectiles (AP and Common).

4 Magazines Forward and Aft.

25 mm Fixed Rounds, Amid Ships.

(B) Special Test Ammunition.

1. Navy Items:

1 - 500# G.P. Bomb, L & P, fr. 205 upper deck, stbd.

1 - 500# G.P. Bomb, L & P, fr. 75 upper most deck, Port.

1 - 350# A.D. Bomb, L & P, fr. 215, upper deck, stbd.

1 - 350# A.D. Bomb, L & P, fr. 20, upper most deck, stbd.

1 - Warhead, L & P, fr. 200, upper deck, port.

1 - Warhead, Loaded, fr. 195, upper most deck, stbd.

1 - Warhead, Loaded, fr. 145, upper most deck, port.

1 - Mine, Mk. 6, Inert, fr. 170, upper most deck, stbd.

1 - Jato Unit, Loaded, fr. 180, upper most deck, port.

28 - Rocket heads, TNT Loaded, base of mainmast, boat deck.

3. SAKAWA

Test "A" - 300 yards. (SUNK)

(A) No service ammunition available.

(B) Special Test Ammunition:- None.

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(h) Submarines:

- (1) U.S.S. TUNA (SS-203) U.S.S. DENTUDA (SS-305)
Test "A" - 2200 yards. Test "A" - 2100 yards.
Test "B" - 1700 yards. Test "B" - 1200 yards.
- U.S.S. PARCHE (SS-384) U.S.S. PILOTFISH (SS-396)
Test "A" - 1200 yards. Test "A" - 2400 yards.
Test "B" - 1400 yards. Test "B" - 300 yards. (SUNK)
(A) 100% Service Allowance of Ammunition.
(B) Special Test Ammunition:
1. Navy Items.
2 - MK 28 Torpedoes (BL & F)
1 - MK 27 Torpedo (BL & F)
2 - MK 18 Torpedoes (L & P)
2 - MK 16 Torpedoes (BL & F)
- (2) U.S.S. SKATE (SS-305)
Test "A" - 400 yards.
Test "B" - 800 yards.
(A) 66 2/3% Service Allowance of Ammunition.
(B) Special Test Ammunition.
1. Navy Items:
2 - MK 28 Torpedoes (BL & F).
1 - MK 27 Torpedo (BL & F).
2 - MK 18 Torpedoes (L & P).
2 - MK 16 Torpedoes (BL & F).
- (3) U.S.S. SKIPJACK (SS-184) U.S.S. APAGON (SS-308)
Test "A" - 1200 yards. Test "A" - 1000 yards.
Test "B" - 1000 yards. Test "B" - 600 yards. (SUNK)
(A) 50% of Service Allowance of Ammunition.
(B) Special Test Ammunition.
1. Navy Items:
1 - MK 33 Torpedo (PL).
2 - MK 28 Torpedoes (BL & F).
1 - MK 27 Torpedo (BL & F).
2 - MK 18 Torpedoes (L & P).
2 - MK 16 Torpedoes (BL & F).
- (4) U.S.S. SEARAVEN (SS-196)
(A) 100% Service Allowance of Ammunition
(B) Special Test Ammunition. None.
Test "A" - 1900 yards.
Test "B" - 1200 yards.

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(1) Type:- APA

(1) U.S.S. CARLISLE (APA-69) U.S.S. CRITTENDEN (APA-77)
Test "A" - 300 yards. Test "A" - 500 yards.
(SUNK) Test "B" - 1400 yards.

U.S.S. GENEVA (APA-86)

Test "A" - 3100 yards.

Test "B" - 2800 yards.

(A) 100% Service Allowance of Ammunition.

(B) Special Test Ammunition.

1. Navy Items:

2 - 500# G.P. Bombs (ANM-64)(L & P), 1 in
Troop Ammunition hold, fr. 65 S; 1 on
upper deck, fr. 32 S.

2 - 350# Depth Bombs (ANM-54-1)(L & P), 1 in
Troop Ammunition Hold, fr. 65 P, 1 on
upper deck, fr. 32 S.

2 - HVA Rocket Heads (L & P), 5" Proj. Stow.,
fr. 159 S.

(on CRITTENDEN ONLY)

5 - Incendiary Clusters (ANM-12)(Loaded) Ammo.
Stowage aft of fr. 125.

(2) U.S.S. BARROW (APA-61) U.S.S. BUTTE (APA-68)
Test "A" - 1300 yards. Test "A" - 2000 yards.
Test "B" - 1800 yards. Test "B" - 2500 yards.

U.S.S. GASCONADE (APA-85)

Test "A" - 2800 yards.

Test "B" - 700 yards.

(A) 100% Service Allowance of Ammunition.

(B) Special Test Ammunition.

1. Navy Items:

2 - Heads, Rocket, 5" O, MK 10-9, BL (Fuzing:
MK 173 VTNF; No BF), 5"/38 projectile
stowage aft.

3 - Heads, Rocket, 5" O, Mk 5-1, BL (Fuzing:
MK 149 NF; MK 164 BF), 5"/38 projectile
Stowage Aft.

5 - Bombs, Incendiary Clusters, AN-M12, Loaded
and Fused individually. C-201-L Centerline.

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- (3) U.S.S. CATRON (APA-71) U.S.S. FILLMORE (APA-83)
Test "A" - 2900 yards. Test "A" - 2500 yards.
Test "B" - 1400 yards. Test "B" - 1900 yards.
(A) 50% Service Allowance of Ammunition.
(B) Special Test Ammunition.
1. Navy Items:
1 - Bomb, GP, 500#, BL, (Fuzing: AN-M103A1 Nose; AN-M101A2 Tail), Upper deck, Fr. 31 stbd.
1 - Bomb, GP, 500#, BL, (Fuzing: AN-M103A1 Nose; M-116 Tail), Troop Ammunition Stow., Fr. 64-66 stbd.
1 - Bomb, AC Depth, 350#, BL, (Fuzing: AN-M103A1 Nose; AN-MK230 Mod 6 Tail), Troop Ammo. Stow., Fr. 64-66, Port.
1 - Bomb, AC Depth, 350#, BL, (Fuzing: AN-MK 219 Nose, AN-MK 230 Mod 6 Tail), Upper deck, fr. 31 Port.
1 - Head, Rocket, 5".0, Mk. 5 Mod 1, BL, (Fuzing: MK 149 NF; MK 164 BF), 5"/38 Proj. Stow. Aft.
1 - Head, Rocket, 5".0, MK 12-9, BL, (Fuzing: MK VTNF, No BF), 5"/38 Projectile Stowage Aft.
1 - Mine, MK 6, Inert, (Live Detonator), Upper Deck fr. 32-36, stbd.
1 - JATO Unit, Loaded, Upper Deck, fr. 45-46, Port.
- (4) U.S.S. BRACKEN (APA-64) U.S.S. BLADEN (APA-63)
Test "A" - 2200 yards. Test "A" - 2800 yards.
Test "B" - 1800 yards. Test "B" - 2300 yards.
(A) 50% Service Allowance of Ammunition.
(B) Special Test Ammunition.
1. Navy Items:
1 - Bomb, GP, 500#, BL, (Fuzing: AN-M103A1 Nose, M-116 Tail), Upper deck, fr. 31 stbd.
1 - Bomb, GP, 500#, BL (Fuzing: AN-M103A1 Nose, AN-M101A2 Tail) Troop Ammo, Stow. Fr. 64-66, stbd.
1 - Bomb, AC Depth, 350#, BL (Fuzing: AN-M103A1 Nose; AN-MK 230 Mod 6 Tail) Upper deck fr. 31 port.
1 - Bomb, AC Depth, 350#, BL, (Fuzing: AN-MK 219 Mod 3 Nose, AN-MK 230 Mod 6 Tail), Troop Ammo. Stow. Fr. 64-66, Port.
1 - Head, Rocket, 5".0, MK 6, Mod 1, BL (Fuzing: MK 149 Nose; MK 164 Base), 5"/38 Projectile Stowage aft.
1 - Head, Rocket, 5".0, Mod 9, BL (Fuzing: 173 VTNF; No BF) 5"/38 Projectile Stowage Aft.
1 - Mine, MK 6, Inert, (Live Det), Upper Deck, fr. 32-36, stbd.
1 - JATO Unit, Loaded, Upper deck, fr. 45-46 Port.

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- (5) U.S.S. BRISCOE (APA-65) U.S.S. NIAGARA (APA-87)
Test "A" - 1700 yards. Test "A" - 4000 yards.
Test "B" - 1100 yards. Test "B" - 3100 yards.
(A) 10% Service Allowance of Ammunition.
(B) Special Test Ammunition.
1. Navy Items:
1 - MK 6 Mine (BL & F), Upper deck, fr. 32, stbd.
1 - JATO Unit (Loaded), Upper deck, fr. 45, port.
- (6) U.S.S. BANNER (APA-60)
Test "A" - 1400 yards.
Test "B" - 2100 yards.
(A) 10% Service Allowance of Ammunition.
(B) Special Test Ammunition.
1. Navy Items.
1 - Bomb, GP, 500#, Loaded and Plugged, Troop Ammo. Stowage, fr. 57-60, stbd.
1 - Bomb, GP, 500#, Loaded and Plugged, Upper deck, fr. 32, stbd.
1 - Bomb, AC Depth, 350#, Loaded and Plugged, Troop Ammo. Stowage, fr. 57-60, port.
1 - Bomb, AC Depth, 350#, Loaded and Plugged, Upper Deck, fr. 32, port.
2 - Heads, Rocket, 5." O, Mk 10 Mod. 9, Loaded, TNT, 5"/38 Projectile Stowage Aft.
- (7) U.S.S. CORTLAND (APA-75) U.S.S. FALLON (APA-81)
Test "A" - 3200 yards. Test "A" - 1400 yards.
Test "B" - 3600 yards. Test "B" - 500 yards.
(A) 100% Service Allowance of Ammunition.
(B) Special Test Ammunition: None.
- (8) U.S.S. GILLIAM (APA-57) U.S.S. DAWSON (APA-79)
Test "A" - 100 yards. Test "A" - 900 yards.
(SUNK) Test "B" - 1200 yards.
(A) 50% Service Allowance of Ammunition.
(B) Special Test Ammunition: None.
- (9) U.S.S. BRULE (APA-66) U.S.S. CARTERET (APA-70)
Test "A" - 1000 yards. Test "A" - 2000 yards.
Test "B" - 800 yards. Test "B" - 2800 yards.
(A) 10% Service Allowance of Ammunition.
(B) Special Test Ammunition: None.

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(j) Type: L.S.T.

- (1) U.S.S. L.S.T. 52 U.S.S. L.S.T. 661
Test "A" - 1800 yards. Test "A" - 2500 yards.
Test "B" - 1800 yards. Test "E" - 2500 yards.
(A) 10% Service Allowance of Ammunition.
(B) Special Test Ammunition.
 1. Navy Items:
 5 - Heads, Rocket, 4."5, MK 10-O, W.P. Loaded,
 Ready Service Locker, Fantail.
- (2) U.S.S. L.S.T. 220
Test "A" - 2300 yards.
Test "B" - 2300 yards.
(A) 10% Service Allowance of Ammunition.
(B) Special Test Ammunition.
 1. Navy Items:
 Heads, Rocket, 4.5", MK 10-O, W.P. loaded,
 Ready service locker, Fantail.
- (3) U.S.S. L.S.T. 545
Test "A" - 4200 yards.
Test "B" - 4200 yards.
(A) 50% Service Allowance of Ammunition.
(B) Special Test Ammunition.
 1. Navy Items:
 5 - Heads, Rocket, 4.5", MK 10-O, W.P. loaded,
 Ready Service Locker, Fantail.
- (4) U.S.S. L.S.T. 133
Test "A" - Out.
Test "B" - 700 yards.
(A) 100% Service Allowance of Ammunition.
(B) Special Test Ammunition:- None.

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(k) Type: L.C.I.

(1) U.S.S. L.C.I. 327

(A) 100% Service Allowance of Ammunition.

(B) Special Test Ammunition:- None.

U.S.S. L.C.I. 615

(A) 100% Service Allowance of Ammunition.

(B) Special Test Ammunition:- None.

(2) U.S.S. L.C.I. 332

(A) 10% Service Allowance of Ammunition.

(B) Special Test Ammunition:- None.

U.S.S. L.C.I. 329

(A) 10% Service Allowance of Ammunition.

(B) Special Test Ammunition:- None.

U.S.S. L.C.I. 549

(A) 10% Service Allowance of Ammunition.

(B) Special Test Ammunition:- None.

U.S.S. L.C.I. 620

(A) 10% Service Allowance of Ammunition.

(B) Special Test Ammunition:- None.

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4. Ship Inspections.

The procedure for inspecting ammunition and explosives fell into three phases and was identical after both Test "A" and Test "B" in determining damage to ammunition and explosives.

Phase one was the hurried and more or less superficial inspections made of ammunition and explosives on-topside and weather decks by the Explosives or Bomb Disposal Officers on the Initial Boarding Teams. Reports of these officers, largely verbal, gave the Explosives Unit the first indication of damage and potential hazards to be encountered.

Phase two of the inspections were made by the gunnery officers of each target vessel as they returned aboard after the tests and made the initial phases of the commanding officers preliminary inspection. These officers had been requested to immediately notify the Explosives Unit aboard the U.S.S. WHARTON if marked changes were observed in ammunition or ammunition stowages. In the cases where changes had occurred and especially after Test "B", members of the Explosive Unit, boarded the vessels most affected and made additional inspections and photographs of damage.

Phase three of the inspections were carried out by teams made up of members of the Explosive Unit who visited each target vessel and thoroughly inspected all ammunition and explosives aboard, in company with a representative of the gunnery department. At the time of these inspections fuze and powder samples were obtained and transferred to the U.S.S. AJAX or the U.S.S. ARTEMIS for testing and shipment to the appropriate activity in the United States.

The reports of the condition of ammunition and explosives were made by the Commanding Officers of the target vessels on CROSSROADS Forms No's 66, 67, and 68, where applicable. These reports were supplemented, when necessary, by additional report forms, notes and especially photographs, made by the Explosives Unit Inspection teams.

From the data contained in these reports and supplemental data, this final report has been prepared.

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5. Special Inspections and Tests.

In anticipation of the need for rapid tests of questionable smokeless powders and in order to determine their safety in storage, special heat test apparatus (134.5°C) (constant temperature bath) was installed in the U.S.S. AJAX (AR-6). By the use of this equipment powders were tested in a period of about one hour and the relative safe-life in storage estimated with a reasonable degree of accuracy. The usual surveillance test at 65.5°C was also used as a further check on the more rapid method. Personnel with long experience in the manufacture and testing of smokeless powder were employed by the Explosives Unit to conduct the surveillance tests in the U.S.S. AJAX and to make special examinations or inspections of suspected powders that were required.

Following Test "A" and again after Test "B", a representative number of the specially fuzed projectiles (BL & F) had their fuzes removed and these fuzes, tagged with date, name of ship and shipboard location, were returned to Naval Ordnance Laboratory, Washington, D.C. for analysis and detailed study by the Explosives Investigation Laboratory.

Similarly, samples of powder, both from that specially supplied for these tests and from the usual service allowance were selected for return to the United States for detailed study of the delayed effects of the radiations, if any. The samples were returned to the Naval Powder Factory, Indian Head, Maryland.

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RESULTS OF TEST "A"

A careful examination of all target vessels which remained afloat after Test "A", revealed that no ammunition or ordnance explosive of any kind detonated or burned as a direct result of the Atomic Bomb. An examination of photographs made at three-second intervals after the air burst indicated that a secondary explosion occurred in the vicinity of the ANDERSON (600 yards from blast). This explosion occurred about three seconds after the blast and photographs show smoke streamers similar to those produced by pyrotechnics and tracers. Several examinations of the ANDERSON were made by divers and they found no indication of any detonation of explosives. All of the torpedoes originally present were located and identified and fourteen of the original twenty-four depth charges stowed on deck were sighted by the divers. Much loose ammunition, both 40MM and 5" powder and projectiles were scattered on the bottom near the vessel (See Photograph DACR-T241-11, Exp. 4 2).

EFFECTS OF BLAST OR SHOCK

The noticeable damage from the blast was confined to the materials which were exposed on weather decks of certain vessels. Certain ready service boxes on various ships near the blast were bent or torn loose from their foundations. Shock damage was minor and only resulted in occasional dents.

There follows a list of all vessels which sustained any significant shock damage to ammunition or ammunition stowage. Vessels not appearing on this list sustained no damage, either primary or secondary to ammunition or ammunition stowage.

The vessels listed below are arranged in the order of distance from the point of detonation of the bomb with approximate yardage to the vessel shown as horizontal distance from a point directly below the bomb burst.

U.S.S. GILLIAM (APA 57) (Sunk) 100 yards.

Contained 50% Service Ammunition with no special test ammunition. No effects observed by divers examination, which would indicate explosions on this vessel. Examination of photographs taken at 3 second intervals after the burst show no indication of ammunition or pyrotechnic explosions.

Ex. Jap SAKAWA. (Contained no ammunition) (Sunk) 300 yards.

U.S.S. CARLISLE (APA 69) (Sunk) 400 yards.

This vessel contained 100% service ammunition allowance and had 1-500 lb. G.P. bomb (TNT) unfuzed, and 1-350 lb. Depth Bomb (HBX) unfuzed on the deck, with other special items in the hold. By examination of photographs taken at 3 second intervals after the burst it appears that a secondary explosion occurred in the vicinity of this vessel. Smoke prevented the

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RESULTS OF TEST "A" (Cont'd)

positive identification of the exact place of this secondary explosion. (See Photograph DACR-T2-11-11. Exp. #2).

U.S.S. SKATE (SS 305) 400 yards

The topside ammunition stowages, both 5" and 40MM were badly twisted, so that they could not readily be opened. No damage to the ammunition which was stowed in these magazines was observed. (Photographs AACR-92-1778-4, 8, and 9).

U.S.S. CRITTENDEN (APA 77) 500 yards.

Contained 100% service allowance of ammunition. One 500 lb. aerial bomb, general purpose, AN-M6A A1, TNT loaded with shipping plugs in place, was secured to the deck with 5/8" wire strap, located on the 01 deck, frame 32, starboard. This ship was struck by terrific blast causing the deck to buckle under bomb. The bomb was unsecured and blown 12 feet aft and 7 feet inboard causing slight damage to the tail fin. Indications of excessive temperatures were not present on the bomb casing. Tail fin retraining ring and shipping plugs removed easily showing no damage to their respective thread lines. (See Photographs BACR-81-906-A; AACR-60-145-4; AACR-60-145-5; and AACR-98-1960-1). One 350 lb. aerial depth bomb, AN-Mk. 54, Mod. 1, HBX loaded with shipping plugs in place, was secured to the deck by a 3/8" wire strap, located on the 01 deck, frame 32, port side. Blast effect opened the sister hook of the securing wire strap allowing the depth bomb to be thrown inboard 6 feet. The depth bomb received extensive damage to tail fin and the complete bomb showed signs of excessive temperatures (i.e. discoloration of preservative paint on the tail fin and bomb casing). No other damage visible. (See Photographs BACR-81-906-2; AACR-60-145-6; and AACR-60-145-7).

U.S.S. ANDERSON (DD 411) (Sunk) 600 yards.

This vessel contained 100% service allowance of ammunition with 8 torpedo warheads (TNT) and 24 depth charges (TNT) on the main deck. By examination of photographs taken at 3 second intervals after the burst it appears that a secondary explosion occurred in the vicinity of this vessel. However, several careful examinations by divers show no indication of the detonation of any explosives. All torpedoes were located and identified, while 14 of the original 24 depth charges were sighted. Much loose ammunition both 40MM and 5" are scattered on the bottom near the vessel. From available evidence it is concluded that no secondary ammunition explosion of any proportions occurred on this vessel. It is possible that a minor explosion of small calibre ammunition or pyrotechnics may have occurred.

U.S.S. INDEPENDENCE (CVL 22) 700 yards.

The effects of shock and blast on this vessel was confined to munitions located on the flight and hanger decks. All aircraft ammunition on planes

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RESULTS OF TEST "A" (Cont'd)

or on the decks was rendered unserviceable due to structural damage. No secondary explosions occurred. The 40MM stowages along the gun sponsoons, port and starboard, were in a completely jumbled condition due to failure of the battens. No damage occurred to the ammunition contained in these stowages, since the 40MM was contained in protective tanks, rather than in clip stowage.

U.S.S. HUGHES (DD 410) 800 yards.

One 5"/38 AA projectile (VT fuze Mk. 53) was thrown to the deck of mount #2 from the loading tray. The fuze was broken by the fall. No other effects due to shock were observed.

U.S.S. LAMSON (DD 367) (Sunk) 900 yards.

Contained 50% service allowance ammunition. There was no indication of secondary explosions on this vessel, either from photographs taken at 3 second intervals after the explosion, or from diver's examinations and underwater photographs.

Ex. Jap NAGATO 900 yards.

One 350 lb. aerial depth bomb, AN-Mk. 54, Mod. 1, HBX loaded with shipping plugs in place, was secured on a bomb skid Mk. 1, Mod. 1, with a 3/8" wire strap, located on the upper most deck, frame 20, starboard side. Due to blast effect the sister hook used for removing slack from the wire strap was straightened allowing the bomb with skid to become unsecured. The bomb was dumped from the bomb skid and blown forward 6 ft. Visual examination showed no damage had occurred to the bomb. Wooden decks in the area were slightly scorched by heat of the "A" bomb, however, preservative paint on the depth bomb casing showed no indications of abnormal temperatures. The depth bomb accessories were not affected. (See Photographs BACR-76-131-10; AACR-2539-2; AACR-2539-3; AACR-2539-4). One 500 lb. aerial bomb, general purpose, AN-M6-4A-1, TNT loaded with shipping plugs in place, was secured on a bomb skid Mk. 1, Mod. 1, with a 3/8" wire strap, located on the upper most deck, frame 74, port side. This bomb was moved 5 inches forward with the bomb skid because of the failure of deck planking to withstand the blast shock of the "A" bomb. Slight damage was suffered to the bomb's tail fin from the blast. The possible disfigurement of the tail vane by falling pieces of superstructure was eliminated because no marks were visible that would accompany a sudden blow. Wooden decks in the vicinity were slightly scorched by the "A" bomb heat but no signs were visible that would indicate excessive heating to preservative paint on the 500 lb. bomb casing. (Photographs BACR-76-131-12; AACR-2539-5). One jet assisted take-off unit, 12AS100E, potassium perchlorate asphalt, and oil loaded, without igniter was secured on a bomb skid Mk. 1, Mod. 1 with a 3/8" wire strap and located on the uppermost deck, Frame 180,

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RESULTS OF TEST "A" (Cont'd)

port side. The Jato Unit showed no indications of damage from heat or blast of the "A" bomb, however, bits of debris fell upon the unit. (See Photographs BACR-76-131-9; AACR-2539-6).

HEAT EFFECTS

Primary Effects:

The flash temperature generated on ammunition stowages caused no fires and only one magazine thermometer located in the ready service boxes showed any abnormally high temperatures. Of particular interest is the fact that although the paint on the thin (1/8") flash shields on the ready boxes had the outer coating of paint blistered, the inner paint surface was unaffected. In the ready service boxes which sustained marked paint blistering there was no increase in the temperature inside the box, as measured by the maximum, minimum thermometers.

The greatest danger from the ammunition aboard the target vessels was due to secondary fires. Below is given the details of all vessels which showed any significant heat effect, either from the primary effect of the "A" bomb, or from secondary fires ignited by this burst.

Yardage shown is the approximate horizontal distance from the point directly below the burst and the vessel.

U.S.S. SKATE (SS 305) (400 yards)

Paint on the 40MM and 5" ammunition topside ready services lockers was scorched and blistered. The temperature inside these magazines registered normal on maximum, minimum thermometers contained therein. (Photographs numbers AACR 92-1778-7, 8, and 9).

U.S.S. CRITTENDEN (APA 77) (500 yards)

The paint on the body of a 350 lb. depth bomb, loaded with HBX, (unfuzed) was blistered. This bomb was also thrown about 6 feet by the blast. No serious damage to bomb. (Photograph number (AACR 60-145-6).

U.S.S. PENSACOLA (CA 24) (600 yards.)

The direct action of the bomb flash was to blister and peel the paint from the ready service 5"/25 boxes, amidships. No excessive temperature was recorded on the inside of the boxes, nor was the ammunition visibly damaged. (Photograph number AACR 87-2539-7). The effects of a secondary fire due to inflammable Q.M. stores on the after weather deck are shown in Photograph number AACR 92-1778-2 and 3.

U.S.S. NEVADA (BB 36) (600 yards)

Effects of the heat or flash of the "A" burst was confined to blistering the paint on topside ready service boxes. Temperatures therein were normal. (Photograph number AACR 97-1535-7).

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RESULTS OF TEST "A" (Cont'd)

U.S.S. INDEPENDENCE (CVL-22) (700 yards)

The heat effects were confined to the burning of HBX loaded torpedo warheads in the after torpedo stowages. This fire was secondary in origin and came from unknown sources. The HBX burned completely without detonating. Some low order explosions occurred due to external heat on the torpedo air flasks.

Ex-Jap BB NAGATO (900 yards)

The wooden deck of this vessel was scorched around the jato unit and the HBX loaded 350 lb. depth bomb. The paint on these munitions was not blistered. (Photograph numbers AACR 87-2539-4 and 6).

U.S.S. SALT LAKE CITY (CA-25) (1000 yards)

The paint on the 5"/25 ready service boxes was blistered. However, no abnormal temperatures were recorded inside the boxes. (Photograph numbers AACR 87-2539-8 and 9).

U.S.S. FALLON (APA-81) (1400 yards)

The paint on the after 5"/38 powder ready service box was blistered. The doors were knocked open by the blast and some of the ends of the powder tanks dished but the cartridges were undamaged. The temperature in this box rose to 124° F. (Photograph numbers AACR 87-2450-1 and 2).

U.S.S. NEW YORK (BB-34) (1900 yards)

A secondary fire in Army Quartermaster materials amidships caused the 3"/50 ready service boxes to be overheated. Temperatures of over 150° F. were recorded and the ammunition was scorched. (Photograph numbers AACR 87-2540-3 and 4).

MATERIAL FOR SPECIAL STUDY, TEST "A".

Ammunition from those vessels which sustained the greatest irradiation, shock, or other effects due to Test "A", was selected for special study. Below are given the details of these explosive components which were selected for return to the United States for special study by various agencies.

(a) Projectile Fuzes.

Fuzes were selected and removed from the specially blind loaded and fused projectiles, which had been exposed in topside locations, either in ready service positions, or in the trays of enclosed gun mounts. These fuzes were selected as having received the severest irradiation and shock of any of those exposed during test "A". These fuzes were shipped for further study to the Naval Ordnance Laboratory, Washington, D. C.

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MATERIAL FOR SPECIAL STUDY, TEST "A" (Cont'd)

PROJECTILE FUZES RETURNED TO UNITED STATES (TEST "A")

No.	Fuze Mk.	Mod.	Vessel	Test Location
1	21	1	USS ARKANSAS (BB 33)	Turret #4, Shell Deck, From 12" A.P.
1	48	1	" " "	Turret #2, Shell Deck, From 12" H.C.
1	48	1	" " "	Turret #4, Gun Chamber From 12" H.C.
1	21	1	" " "	Turret #4, Gun Chamber From 12" A.P.
1	21	1	" " "	Turret #2, Gun Chamber From 12" A.P.
5	28	Mods.	" " "	Ready Service Casemates 5"/51 H.C.
1	29	3	" " "	Turret #4, Gun Chamber 12" H.C.
1	29	3	" " "	Turret #2, Gun Chamber 12" H.C.
5	29	3	" " "	Ready Service Casemates 5" H.C.
1	48	1	USS PENSACOLA (CA 24)	Tray of Turret #2 8" H.C.
1	21	1	" " "	Tray of Turret #2 8" A.P.
1	48	1	" " "	Tray of Turret #4 8" H.C.
1	21	1	" " "	Tray of Turret #4 8" A.P.
2	29	3	" " "	#2 Shell Deck (Boxed)
2	50	2	" " "	#2 Shell Deck (Boxed)
3	50	2	" " "	Ready Service Amidship 5"/25
3	53	5	" " "	Ready Service Amidship 5"/25
2	29	3	" " "	Turret #2 Tray, 8" H.C.
1	29	3	" " "	Turret #4 Tray, 8" H.C.
1	21	1	USS SALT LAKE CITY (CA25)	Turret #4 Shell Deck, 8" A.P.
2	28	1	" " " " "	Turret #4 Shell Deck, 8" H.C.
1	48	1	" " " " "	Turret #2 Shell Deck, 8" H.C.
2	29	3	" " " " "	Turret #4 Shell Deck, 8" H.C.

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MATERIAL FOR SPECIAL STUDY. TEST "A" (Cont'd)

PROJECTILE FUZES RETURNED TO UNITED STATES (TEST "A") (cont'd)

<u>No.</u>	<u>Fuze Mark</u>	<u>Mod.</u>	<u>Vessel</u>	<u>Test Location</u>
2	29	3	USS SALT LAKE CITY (CA 25)	Turret #2 Gun Chamber 8" H.C.
4	29	3	" " " " "	Ready Service Main Deck 5"/25 H.C.
1	21	1	USS PENNSYLVANIA (BB 38)	Turret #2 Gun Chamber 14" A.P.
1	48	1	" " " "	Turret #2 Gun Chamber 14" H.C.
1	29	3	" " " "	Turret #2 Gun Chamber 14" H.C.
1	21	1	" " " "	Turret #4 Gun Chamber 14" A.P.
1	48	1	" " " "	Turret #4 Gun Chamber 14" H.C.
1	29	3	" " " "	Turret #4 Gun Chamber 14" H.C.
3	50	2	" " " "	Inside Mount #1, 5"/38
3	53	6	" " " "	Inside Mount #1, 5"/38
3	28	10	" " " "	Inside Mount #1, 5"/38
3	50	2	" " " "	Inside Mount #8, 5"/38
3	53	6	" " " "	Inside Mount #8, 5"/38
3	28	1	" " " "	Inside Mount #8, 5"/38
1	21	1	USS NEVADA (BB 36)	Turret #2 Gun Chamber 14" A.P.
1	48	1	" " " "	Turret #2 Gun Chamber 14" H.C.
1	29	3	" " " "	Turret #2 Gun Chamber 14" H.C.
1	21	1	" " " "	Turret #3 Gun Chamber 14" A.P.
1	48	1	" " " "	Turret #3 Gun Chamber 14" H.C.
1	29	3	" " " "	Turret #3 Gun Chamber 14" H.C.
3	50	2	" " " "	Inside Mount #1 5"/38
3	53	6	" " " "	Inside Mount #1 5"/38
3	28	10	" " " "	Inside Mount #1 5"/38
3	50	2	" " " "	Inside Mount #8 5"/38
3	53	6	" " " "	Inside Mount #8 5"/38
3	28	10	" " " "	Inside Mount #8 5"/38

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MATERIAL FOR SPECIAL STUDY, TEST "A" (Cont'd)

PROJECTILE FUZES RETURNED TO UNITED STATES (TEST "A") (Cont'd)

<u>No.</u>	<u>Fuze Mark</u>	<u>Mod.</u>	<u>Vessel</u>	<u>Test Location</u>
1	21	1	USS NEW YORK (BB 34)	Turret #2 Gun Chamber 14" A.P.
1	29	3	" " " " "	Turret #2 Gun Chamber 14" H.C.
1	48	1	" " " " "	Turret #2 Gun Chamber 14" H.C.
1	21	1	" " " " "	Turret #4 Gun Chamber 14" A.P.
1	29	3	" " " " "	Turret #4 Gun Chamber 14" H.C.
1	48	1	" " " " "	Turret #4 Gun Chamber 14" H.C.
2	29	3	" " " " "	Ready Service Casemate 5"/51 H.C.
2	28	10	" " " " "	Ready Service Casemate 5"/51 H.C.
4	50	2	USS SARATOGA (CV 3)	Inside Mount #5, 5"/38
4	53	6	" " " "	Inside Mount #5, 5"/38
4	28	10	" " " "	Inside Mount #5, 5"/38
2	50	2	USS RALPH TALBOT (DD390)	Ready Service Mount #4
2	53	6	" " " " "	Ready Service Mount #4
2	28	10	" " " " "	Ready Service Mount #4

Fuzes were taken from each of the following vessels, RHIND, (DD 404), MUSTIN (DD 413), MUGFORD (DD 389), CONYNGHAM (DD 371), MAYRANT (DD 402), as follows:

2	50	2	Inside 5"/38 Mount #2
2	53	6	Inside 5"/38 Mount #2
2	28	10	Inside 5"/38 Mount #2

(b) Bomb and Rocket Fuzes.

Fuzes were selected and removed from the plaster loaded bombs and rocket bodies, which were exposed during Test "A" on the open decks of certain vessels, or which were suspended from the racks of certain planes carried on the target vessels. The following list gives the details of the location and exposure of the selected fuzes. These fuzes are to be shipped for further study with the projectile fuzes to the Naval Ordnance Laboratory, Washington, D.C.

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MATERIAL FOR SPECIAL STUDY, TEST "A" (Cont'd)

BOMB AND ROCKET FUZES RETURNED TO UNITED STATES (TEST "A") (Cont'd)

<u>No.</u>	<u>Fuze Mark</u>	<u>Vessel</u>	<u>Test Location</u>
2	ANM103A1	USS SARATOGA (CV 3)	Suspended on Plane, Flight Deck, Frame 90.
2	ANM101A2	" " " "	Suspended on Plane, Flight Deck, Frame 90.
6	Mark 146	" " " "	Suspended on Plane, Flight Deck, Frame 50.
1	AMN103A1	USS PENNSYLVANIA (BB 38)	Suspended on Plane (Catapult)
1	ANM100A2	" " " "	Suspended on Plane (Catapult)
1	ANM103A1	" " " "	Suspended on Plane, Frame 135, Main Deck
1	ANM100A2	" " " "	Suspended on Plane, Frame 135, Main Deck
1	ANM100A2	USS NEVADA (BB 36)	Suspended on Plane, Frame 130, Main Deck
1	ANM103A1	USS NEW YORK (BB 34)	Suspended on Plane (Catapult)
1	M115	" " " "	Suspended on Plane (Catapult)
1	ANM103A1	USS CATRON (APA 71)	On Main Deck Mounted in 500# G.P. Bomb.
1	ANM101A2	" " " "	On Main Deck Mounted in 500# G.P. Bomb.
1	ANMK219-3	" " " "	On Main Deck Mounted in 350# Depth Bomb.
1	ANMK230-6	" " " "	On Main Deck Mounted in 350# Depth Bomb.
1	Mark 173	" " " "	5"/38 Ready Service Aft.
1	Mark 149	" " " "	5"/38 Ready Service Aft.
		USS FILLMORE (APA 83)	Same as for USS CATRON (APA 71)
2	ANM103A1	USS BRACKEN (APA 64)	From Bomb on Main Deck
1	M116	" " " "	From Bomb on Main Deck
1	ANMK230-6	" " " "	From Bomb on Main Deck
1	Mark 173	" " " "	5"/38 Projectile Stowage Aft.
1	Mark 149	" " " "	5"/38 Projectile Stowage Aft.
		USS BLADEN (APA 63)	Same as for USS BRACKEN (APA 64)

NOTE: The damage sustained by the fuzes on the planes was due to being struck by adjacent objects as the planes were damaged. No other effects on any fuzes were noted.

(c) Smokeless powders.

In order to provide means of obtaining rapidly, a relative measure

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MATERIAL FOR SPECIAL STUDY, TEST "A" (Cont'd)

of safety for smokeless powders, the Ordnance Material Group conducted German accelerated surveillance tests (134.5°C) aboard the U.S.S. AJAX. By this test, coupled with visual examination, violet paper tests and standard surveillance tests (65.5 C) it was possible to quickly ascertain the safety of smokeless powders exposed to the action of the "A" Test. In the table below is given the results of the German tests at 134.5°C. The powders listed herein were secured in sufficient quantity so that at least one pound of each sample was shipped to the Naval Powder Factory, Indianhead, Maryland, for study of the effects of irradiation. These samples represent a series of powders taken from the most exposed locations. The SPCG powders are those supplied especially for this test by the Bureau of Ordnance. Other powders are those issued to the ships as part of their service allowance.

<u>Index No.</u>	<u>Ship</u>	<u>Location</u>	<u>Minutes to Change Violet Paper at 134.5°C</u>
SPDN 3378	USS ARKANSAS (BB33)	3"/50 Ready Service Main Deck	70-75 Minutes
SPCG 8823	USS ARKANSAS (BB33)	12"/50 Turret #4	35-35 Minutes
SPD 7856	USS ARKANSAS (BB33)	12"/50 In Turret #2	70-70 Minutes
SPDN 7715	USS NEVADA (BB36)	40MM Clipping Room	45-50 Minutes
SPDN 4941	USS NEVADA (BB36)	5"/38 Handling Room #8	45-45 Minutes
SPCG 8778	USS NEVADA (BB36)	14"/45 In Turret #4	30-35 Minutes
SPCG 8823	USS PENSACOLA (CA24)	8"/55 In Turret #4	30-35 Minutes
SPD 3908	USS PENSACOLA (CA24)	8"/55 In Turret #2	70-70 Minutes
SPDB 9950	USS PENSACOLA (CA24)	5"/38 Ready Service Main Deck	95-100 Minutes
SPDB 7079	USS NEW YORK (BB34)	14"/45 Turret #2	55-60 Minutes
SPCG 8774	USS NEW YORK (BB34)	14"/45 Turret #4	30-35 Minutes
SPDN 3444	USS NEW YORK (BB34)	3"/50 Ready Service	75-75 Minutes
SPDN 3198	USS NEW YORK (BB34)	(Amidships, All over heated by fire)	85-85 Minutes
SPDN 5995	USS NEW YORK (BB34)		70-70 Minutes
SPDN 5405	USS SKATE (SS305)	5"/51 Ready Service	55-55 Minutes
SPDN 6628	USS SKATE (SS305)	5"/51 Ready Service	
SPDN 2876	USS SKATE (SS305)	40MM Ready Service	50-50 Minutes
SPDN 6542	USS RHIND (DD404)	5"/38 Mount #1	45-45 Minutes
UG220.	USS RHIND (DD404)	40MM Clipping Room	45-45 Minutes
TEI.45			
SPDN 6378	USS BUTTE (APA68)	40MM Clipping Room (over heated)	50-50 Minutes

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MATERIAL FOR SPECIAL STUDY, TEST "A" (Cont'd)

<u>Index No.</u>	<u>Ship</u>	<u>Location</u>	<u>Minutes to Change Violet Paper at 134.5°C.</u>
SPD 2643	USS BRULE (APA 66)	5"/38 Magazine	75-80 Minutes
APDN 5723	USS BRULE (APA 66)	40MM Magazine	50-50 Minutes
SPDN 4777	USS CRITTENDEN (APA 77)	5"/38 Ready Service	50-50 Minutes
SPDN 7305	USS CRITTENDEN (APA 77)	40MM Open Deck, in splinter shields.	50-50 Minutes
SPDN 4255	USS FALLON (APA81)	5"/38 Ready Service Aft.	65-65 Minutes

NOTE: Visual examination of all the above powders gave no indication of change.

(d) Proto type Weapons.
STV ("Bumble Bee") Missile.

One STV missile was exposed upright on the deck of the SALT LAKE CITY. The missile suffered no damage.

One crated missile was exposed in the hold of the BRULE (APA 66), with hatches open. No damage occurred to the missile or its container.

These missiles have been returned to the Applied Physics Laboratory, John Hopkin's University, Silver Springs, Maryland.

C. RESULTS OF TEST "B"

A careful examination of all target vessels, which remained afloat after Test "B", revealed that no ammunition and explosives ordnance of any kind detonated or burned. An examination of aerial and ground photographs made at from 1 to 3 second intervals after the explosion of the Atomic Bomb indicates that no ammunition was detonated or set on fire by this bomb.

The inspections made of ammunition on target vessels included all that on board, both special items and service allowances.

EFFECTS OF BLAST

There was no evidence of blast effects on ammunition or on top-side ready service boxes or rooms.

HEAT EFFECTS

There was no evidence of heat effects from the "B" Test on any ammunition or explosives.

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RESULTS OF TEST "B" (Cont'd)

HEAT EFFECTS (Cont'd)

The ready service and topside ammunition stowage temperature ranged from 95° to 110° F. Magazines temperatures ranged from 85° to 100° F. These temperatures are within the ranges observed in the Bikini locality and in these stowages under normal conditions.

SHOCK EFFECTS

In many vessels within 1000 yards of the center of the burst the effects of underwater shock, transmitted by the hull of the vessel caused ammunition to be thrown to the deck and ammunition containers to be knocked from supporting racks. The ammunition withstood the effects of this shock and no change which rendered it unfit for service use was noted, with the exception of a few 5"/38 cartridges in the magazines of the U.S.S. FALLON (APA 81) which are described below.

The most serious defect observed was that of ammunition stowage arrangements. In all vessels that received major shock much of the ammunition was thrown clear of the stowage racks. The battens, stanchions and their supporting fittings were notably weak and inadequate for the amount of shock received.

There follows a more detailed description of the shock effects on ammunition and its stowages on all vessels which were significantly effected. The vessels are arranged in order of distance from point of detonation of the "B" burst with yardage shown as the approximate horizontal distance from the center of the target array to the vessel.

U.S.S. FALLON (APA 81) (500 yards)

The 5"/38 powder tanks were moved and scattered through the magazines. No semblance of orderly stowage remained. Sufficient force was applied to eject several of the cartridges from the powder tanks while many tanks were badly bent and dented. Both the battens and the stanchions were bent and broken by the motion of the ammunition.

The 5"/38 projectile magazines were in complete disorder due to an upward movement of the projectiles, which caused the failure of the battens and stanchions. Many of the rotating bands of the projectiles were scarred and dented, but these projectiles appeared to be in a serviceable condition.

The after 5"/38 ready service powder boxes were broken and powder tanks were thrown to the deck; doors were broken off but powder tanks were undamaged.

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RESULTS OF TEST "B" (Cont'd)

SHOCK EFFECTS (Cont'd)

U.S.S. FALLON (APA 81) (Cont'd) (500 yards)

The 20MM ready service boxes were forced open by an upward motion of such violence that 20MM drums and boxes were thrown clear of the boxes and scattered on deck. The 20MM ammunition was not damaged.

The 40MM ready service rooms were in a badly jumbled condition since the battens had jumped clear of the pins, and allowed the 40MM cans to fall to the deck. None of the 40MM ammunition appeared to be damaged. (Photographs BACR-67-4166-7, 9, and 11).

U.S.S. HUGHES (DD 410) (700 yards)

The forward and after 5"/38 powder magazines, were piled with irregular heaps of powder tanks because the stanchions had given way either at the top or bottom, and allowed the powder tanks to fall from the racks. The stanchions (vertical battens) were undamaged. When the battens (horizontal) were in place they rested in an ("L") shaped fitting on the bulkhead. These battens were jarred from the fittings by a vertical movement of the vessel. The powder tanks were but slightly dented.

The 5"/38 projectile magazine stowages were some what disarranged due to the failure of the aluminum battens. Projectiles were thrown clear of the racks but were undamaged except for a few dents on the rotating bands. (Photographs ABCR-76-1931-6 and 7).

In the upper handling rooms of mounts 1, 2, 3, and 4 both powder tanks and projectiles were strewn about the deck. The sliding rings which held the projectiles were jarred clear of the nose of the projectile allowing it to fall to the deck. The powder tanks fell because the upward motion of the ship threw the battens out of the retaining slots. The ammunition remained in a serviceable condition. (Photographs ABCR-76-1931-1, 2, 3, and 4).

U.S.S. PENSACOLA (CA 24) (700 yards)

The after 8" powder and 5"/38 magazines were found to have charges thrown to the deck. This was due to the vertical channel or angle iron battens being thrown clear of their retaining slots. The battens were undamaged. The ammunition tanks were slightly dented but the cartridges were not serviceable. (Photographs ABCR-80-1676-2, 3, and 4).

The forward 8" powder magazines were generally in normal array but 2 charges were on the deck. Battens were in place but the powder tanks had been thrown against the overhead and in falling back the lip of the adjacent tank tore open the falling powder tank.. This allowed a heavy

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RESULTS OF TEST "B" (Cont'd)

SHOCK EFFECTS (Cont'd)

U.S.S. PENSACOLA (CA 3) (Cont'd) (700 yards)
concentration of ether-alcohol vapor to permeate the magazine, and because of the lack of ventilation this vapor presented a serious fire and health hazard. With proper ventilation restored these powder charges could have been retanked and used as serviceable charges.

The ready service and 40MM clipping rooms showed evidence of the ammunition striking the overhead, while the battens also jumped clear of their cleats. The boxes were dented but the ammunition appeared to be in a serviceable condition. On the shell decks of all 8" mounts the stowed projectiles had been thrown to the side and many fell to the deck. No visible damage to the projectiles resulted. (Photographs ABCR-76-1676-1; ABCR-78-1678-1, and 2).

U.S.S. MAYRANT (DD 402) (700 yards)

An upward motion of this vessel caused the 5"/38 projectiles in the ready service racks of mounts #1 and 2 to jump clear of ring supports and fall to the deck. This same condition occurred in the lower handling room of mount #2. The projectiles were undamaged.

In the forward projectile magazines some projectiles were thrown clear of the battens. Batten and stanchions held the bulk of the projectiles but were bent so as to require replacement. In the powder magazine the battens were slightly bent, and damage was slight. No effect on ammunition was observed. The ready service 20 and 40MM stowage remained normal.

U.S.S. GASCONADE (AFA 85) (700 yards)

From inspection of 5"/38 after projectile and powder magazines it was apparent that the vessel had undergone violent movement and projectiles and powder were thrown out of their respective stowage spaces. Vertical stanchions were loosened (mostly near the deck) thus freeing the horizontal battens and allowing the projectiles and powder to fall to the deck. The 5"/38 ammunition was not damaged. In the 40MM forward stowages the cans had been thrown as far as 4 feet from the racks. This was due to the horizontal battens being thrown off their retaining cleats. The ammunition was undamaged. (Photographs ABCR-100-4207-5; ABCR-100-4210-11, and 12)

U.S.S. LST 133 (700 yards)

The effect of "B" Test on the ammunition aboard this vessel resulted largely from the effect of a descending column of water.

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RESULTS OF TEST "B" (Cont'd)

SHOCK EFFECTS (Cont'd)

U.S.S. LST 113 (Cont'd) (700 yards)

Ready service boxes (20MM) were torn from the deck and the tops ripped off. The 20MM drums were scattered about the deck, and in some cases a few rounds were ejected from the drums. No further damage to the ammunition was noted. Below deck magazines were in normal condition. (Photographs ABCR-82-4218-4, 5, 6, and 7).

U.S.S. NEVADA (BB 36) (1000 yards)

U.S.S. PENNSYLVANIA (BB 38) (1400 yards)

The battens in the 14" powder magazines jumped clear of their retaining slots and allowed a few tanks of powder to slide to the deck. The powder tanks, battens, and stanchions were undamaged.

The 40 and 20MM stowages were disarranged due to battens jumping clear of retaining slots, however, the ammunition was undamaged. (Photographs ABCR-76-1934-4, and 5).

U.S.S. BRISCOE (APA 65) (1100 yards)

The ready service stowages of 40MM ammunition on this vessel indicates clearly the weakness of the batten construction. It appears that these battens moved upward and clear of the retaining cleats, and this allowed the 40MM boxes to fall clear of the supporting racks. The 20MM clipping room (B-0309-M) was littered with the drums that were thrown clear of the brackets that hold them to the bulkhead. No ammunition was damaged. The 5"/38 after ready service boxes were undamaged, and below deck magazines showed little or no change. (Photographs ABCR-97-4046-3, and 4).

MATERIALS FOR SPECIAL STUDY, TEST "B"

The following lists of materials were shipped to various agencies in the United States for special examination. These items are those requested by the Bureau of Ordnance for special study.

Certain items which were to be returned to the United States have not been shipped since those items were radiologically active and considered unsafe for handling and shipment.

Insofar as practical the samples of all materials returned were removed from places most exposed to radiological activity.

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MATERIALS FOR SPECIAL STUDY. TEST "B" (Cont'd)

<u>FUZES</u>			
<u>No.</u>	<u>Item</u>	<u>Vessel</u>	<u>Place of Exposure During Test "B"</u>
1	ANM100A2 Bomb Fuze	NEW YORK (BB 34)	Plane on Deck
1	ANM103A1 Bomb Fuze	NEW YORK (BB 34)	Plane on Deck
3	Mk. 50 Mech. Time Fuze	MUSTIN (DD 413)	Mount #4.
3	Mk. 28-10 Base Fuze	MUSTIN (DD 413)	Mount #4.
3	Mk. 149, Rocket Nose Fuze	BUTTE (APA 68)	Magazine C-305-M
2	Mk. 73, Rocket VT Fuze	BUTTE (APA 68)	Magazine C-305-M
3	Mk. 149, Rocket Nose Fuze	BARROW (APA 61)	Magazine C-305-M
2	Mk. 73, Rocket VT Fuze	BARROW (APA 61)	Magazine C-305-M
1	Mk. 149, Rocket Nose Fuze	BRISCOE (APA 65)	Magazine C-305-M

NOTE: These fuzes gave no outward appearance of damage. The above fuzes have been shipped to the Naval Ordnance Laboratory, Washington, D.C., for complete examination and testing.

PYROTECHNICS

The following pyrotechnics are being shipped to the Naval Ordnance Laboratory, Washington, D.C., for further study. These pyrotechnics show no outward signs of deterioration.

<u>Vessel</u>	<u>Pyrotechnic Data</u>
USS INDEPENDENCE (CVL 22)	2 - Float Lights, Mk. 4-2 6 - Signals, Hand, Red. 10 - Very Cartridges, Mk. 2 (Green) 20 - Very Cartridges, Mk. 2 (White) 25 - Cable Cutting Cartridges.
USS SALT LAKE CITY (CA 25)	1 - Abandon Ship Kit.
USS TUNA (SS 203)	1 - Abandon Ship Kit. 1 - False Target Shell, Mk. 1. 1 - Ship Emergency Identification Signal, Mk. 3.
USS SEARAVEN (SS 196)	1 - False Target Shell, Mk. 1. 1 - Signal Rocket, Mk. 1.
USS PARCHE (SS 384)	1 - False Target Shell, Mk. 1. 1 - Ship Emergency Identification Signal, Mk. 2. 1 - Signal, Submarine Float, M2-0. 2 - Signal Rocket, Mk. 1. 10 - Cartridge, Very Signal.

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MATERIALS FOR SPECIAL STUDY. TEST "B" (Cont'd)

SMOKELESS POWDER

The following samples of smokeless powder were selected from topside locations nearest areas of marked radioactivity. These samples show no visible evidence of deterioration or change. Violet paper samples exposed in powder sample bottles in these stowages were not visibly effected.

The samples of smokeless powder were shipped in 2 pound lots to the Naval Powder Factory, Indianhead, Maryland, for further study.

<u>Powder Index</u>	<u>Data on Sample</u>	<u>Vessel</u>	<u>Minutes to Change Violet Paper at 120°C at 134.5°C</u>	
SPDN 6329	4"/50 from below deck Magazine	USS SEARAVEN (SS196)		42-55
SPDN 4001	5"/51 Forward Mag.	USS TUNA (SS203)		40-55
SPDN 2016	20MM on Bridge	USS TUNA (SS203)		40-55
SPDN 7914	20MM R/S Conn. Tower	USS PARCHE (SS384)		40-50
SPD 2618	5"/25 R/S Conn. Tower	USS PARCHE (SS384)		95-100
SPDN 8136	20MM Main Deck R/S	USS PENSACOLA (CA24)		45-50
SPCG 8823	8"/55 Loading Tray #4	USS PENSACOLA (CA24)	110	35-35
SPD 3903	8"/55 Loading Tray #2	USS PENSACOLA (CA24)		85-90
SPDN 2871	5"/38 Loading Tray Mount #1	USS NEVADA (BB36)		70-75
SPCG 8823	5"/38 Loading Tray Mount #8	USS NEVADA (BB36)	110	35-35
SPCG 8823	5"/38 Loading Tray Mount #1	USS PENNSYLVANIA (BB38)	110	35-35
SPCG 8823	5"/38 Loading Tray Mount #8	USS PENNSYLVANIA (BB38)	110	35-35
ZC329WC44	Crtg. No. 20MM Bridge R/S	USS PENNSYLVANIA (BB38)		45-45
SPDN 3444	3"/50 R/S Boat Deck	USS NEW YORK (BB34)		75-73
SPDB 7079	14"/50 Turret #2 Loading Tray	USS NEW YORK (BB34)		65-70
SPCG 6774	14"/50 Turret #2 Loading Tray	USS NEW YORK (BB34)	110-115	40-40
SPD 6358	8"/55 Turret #2	USS SALT LAKE CITY (CA25)		75-90
SPCG 8823	8"/55 Turret #4	USS SALT LAKE CITY (CA25)	110	40-40
SPDN 8040	5"/38 Mount #2	USS MUSTIN (DD413)		75-73
SPCG 8823	5"/38 Mount #3	USS MUSTIN (DD413)	110	40-40
SPDN 6378	40MM R/S	USS BUTTE (APA68)		50-50
SPDN 5114	20MM R/S Port Fr. 65	USS BUTTE (APA68)		45-45

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MATERIALS FOR SPECIAL STUDY, TEST "B" (Cont'd)

SMOKELESS POWDER (Cont'd)

SPDN Normal Ranges - 40%
SPCG Normal Ranges - 100%

GENERAL CONCLUSIONS

As the result of Test "A" it is concluded that the heat and shock from an air burst of this type bomb is not sufficient to detonate naval ammunition in normal stowages or when directly exposed on the weather decks of vessels. The ammunition and explosives which were exposed directly to the blast of the bomb, had, in a few cases, the paint blistered on the containers. The heat duration and rate of transfer were insufficient to cause explosions in TNT, or HBX loaded munitions when these items were exposed unshielded to the direct blast of the bomb. Vessels which showed no evidence of ammunition explosions subsequently sank as the results of the "A" Test.

It appears that the nature and duration of the detonation in the Atomic bomb air burst is such that it does not induce explosions either from heat or shock in the usual high explosives. (TNT, HBX, Expl. D, PETN).

As the result of Test "B" it is concluded that the shock wave transmitted through the water and into the vessel does not induce explosions in naval ammunition. This shock is the only phenomena of Test "B" which significantly effected ammunition and then only caused failure of the stowage facilities, battens, stanchions, etc., with attendant damage to ammunition tanks and projectiles. Vessels which sank as the result of the effects of Test "B" showed no evidence of ammunition or high explosive detonations.

As the result of these tests it is concluded that there is little danger from induced explosions in ammunition, or high explosives, as the direct result of an attack with an atomic bomb of the size used in these tests.

Stowage facilities should be strengthened to withstand greater shock, in order to over-come the effects of a nearby underwater atomic bomb burst; as there is always the possibility of an explosion due to rough treatment attendant upon the collapse of stowage arrangements.

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Enclosure (D)

Subject: Bureau of Ordnance Material
Group Final Report for
Tests "A" and "B".

PART V - GUNS AND MOUNTS

Planning
Ship Inspection
Damage Test "A"
Damage Test "B"
Comparison between Test "A" and Test "B"
Summary

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PLANNING

Early activity in Washington included preparation and dissemination of preliminary instructions to the Naval Shipyards and the ships themselves for their preparation as target ships. These instructions were later developed into forms on which data could be presented uniformly for use in comparative evaluation. These forms were designed to cover general conditions visually on one sheet and specific observations for each mount or turret on separate sheets. The preliminary instructions and forms together with more detailed suggestions for their completion and return during various phases of the test were assembled into the "Red Book", which bore the same file number as Annex "A" of the Operation Plan.

Before leaving Washington a reference library of Ordnance publications was assembled. Personnel at the Naval Ordnance Laboratory, the Naval Gun Factory and the General Ordnance School assisted the Guns and Mounts Unit in selecting Ordnance Pamphlets and Ordnance Data sheets. In addition, tools and instruments were assembled in Washington for use in the Tests. The instruments included many special devices, such as bore gages, hydraulic pressure gages and bore searchers, not normally available outside a Navy Yard or the Naval Gun Factory. The reference library, tools and instruments proved of great value at the site of the tests.

The "Red Book" contained all the report forms for the Bureau of Ordnance Group including those on Turrets, Guns, Mounts, Catapults and Depth Charge Projectors (the last two are divided cognizance) together with instructions for the preparation of the forms by target ships' personnel. Annex "A" of the Operation Plan specified the mounts to be in operation during the test.

To assist in the general preparation of the target ships, the Mobile Turret Unit went to Pearl Harbor several weeks in advance of the remainder of the organization. While in Pearl Harbor, the Mobile Turret Unit rendered assistance to the Instrumentation Unit in location of physical measuring instruments.

In some cases, it was necessary to make a special check of the condition of turrets and mounts before the test so that a true comparison could be made with conditions after the test. For example, the lack of operable power drives in turret (4) of the U.S.S. PENNSYLVANIA was reported and needed no check, however, the condition of the Main Battery of the U.S.S. NEW YORK, which had not been fired since regunning, required detailed examination with especial emphasis on gun alignment.

In at least one case Navy Yard decommissioning work, prior to the assignment of a vessel to Joint Task Force ONE, had deprived a mount of power; in another case the cables carrying the director signal which provided automatic operation of the mount had been severed. Several mounts

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PLANNING (Cont'd)

operated erratically in automatic and in local control. It was necessary to determine these and similar facts in advance of the test.

Five inch mounts on the U.S.S. SARATOGA, U.S.S. MUGFORD, U.S.S. WILSON, U.S.S. RHIND, and U.S.S. RALPH TALBOT, and 40MM mounts on the U.S.S. PENSACOLA, U.S.S. MUGFORD, U.S.S. WILSON, U.S.S. RHIND, U.S.S. BRACKEN, U.S.S. CORTLAND, U.S.S. CRITTENDEN, and U.S.S. DAWSON, were planned to be energized and in operation during Test "A". This procedure was carried out and provided a realistic comparison between the vulnerability of the mounts in both conditions, operating and static. The physical distribution of guns and mounts material was designed to cover the range of possible damage from the maximum to the minimum. Special hydraulic oil was placed in the speed gear assemblies of certain representative non-operating mounts. This hydraulic fluid was furnished by the Bureau of Ordnance and was exposed in order to test for special qualities of non-inflammability. On the U.S.S. SARATOGA's after five-inch twin mount were mounted two three-ton cameras. During Test "A" the mount was operated in automatic with a Mark 37 director and was held on the true bearing of the NEVADA in order to orient the cameras towards the intended point of mission. Temperature paint on small metal plates was furnished by the Instrumentation Group and the plates were distributed on turrets and mounts throughout the array.

In order to obtain representative test samples of turrets and mounts, variations in their conditions were prescribed. Some mounts and turrets were in condition "Yoke" and some in "Zebra".

In certain cases the gun breeches were open and in other cases closed. In some guns primers were inserted in the firing-lock or in short unloaded cases. The angle of train and elevation was varied to obtain comparative structural reactions. In specific installations for test "A" the angles of train were determined in cooperation with the Instrumentation Group to expose test panels secured on the mount shields. In one main battery gun on each of the battleships ARKANSAS and PENNSYLVANIA a Gamma Ray Camera was mounted. These cameras were lowered seven inches into the gun muzzles and secured with lines and wooden wedges. This instrumentation required special angles of train and elevation in the direction of the anticipated center of the explosion. Ammunition was placed in certain mounts and turrets simulating battle conditions. Other mounts and turrets were clear of ammunition to simulate normal operation.

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SHIP INSPECTION

The Guns and Mounts Unit was responsible for turrets, gun mounts, and machine guns, for providing advice and assistance to the Target Ship, Repair Ship, and Naval Shipyard personnel, and for accurately determining conditions of equipment before and after the tests in order to permit an evaluation of any change in military effectiveness and the desirability of change in design, manufacture or maintenance practices. In work on turrets and eight-inch mounts the cooperation of the Bureau of Ship organization was solicited in regard to structural features. The responsibilities of the unit included preparation of detailed instructions for the positioning of the turrets and mounts and the conditions under which they were to meet the tests. This was worked out in close accord with the Explosives Unit in connection with simulated service conditions, the presence and location of ammunition, and with the Fire Control Unit regarding mounts in operation.

The inspections of the guns, mounts and turrets were performed by personnel of the Guns and Mounts Unit assisted by the ship's force. The equipment was tested in accordance with the Bureau of Ordnance Manual utilizing the "check off" list specified for each particular piece of equipment. The major portion of the target ships were first visited at west coast naval shipyards and Pearl Harbor by members of the inspection team. The ships Gunnery Officer was contacted upon boarding and a thorough inspection of the Ordnance Equipment was made.

The visual and manual observations were then compared with the information gathered and recorded by the Ship's Gunnery Personnel. If corrections to the recording forms were necessary they were so discussed and made. Upon arriving at Bikini, every vessel in the target array was visited by the entire unit of the inspection team. The officers and men of the team familiarized themselves with the plan of the ship, the means of access to the equipment and, most important of all, the equipment itself. Members of the ship's Gunnery Department accompanied the officers and men in this tour of inspection pointing out known defects and peculiarities of the various Ordnance Units for which the Guns and Mounts Unit was responsible. Note-books were used to record this information and at the end of each days inspection they were filed for future reference. The data forms were again reviewed to ascertain whether or not all necessary and pertinent information had been recorded. When the inspection party was satisfied, the Ship's Gunnery Officer was instructed to complete the finished forms.

When permission was secured to reboard the target ships after Test "A" the inspection team conducted first a visual inspection of the equipment to ascertain damage and when the visual inspection proved to the satisfaction of the inspector that the equipment was not damaged all units that could be operated by hand were so operated. Finally if power was available and the units had power drives, the equipment was operated in the various applicable methods of power operation. Upon completion of

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SHIP INSPECTION (Cont'd)

the inspections the ship's Gunnery Officer was instructed to complete the data forms, recording all information regarding the equipment. This was done for all units whether or not they had sustained damage. This inspection plan was followed until all vessels in the target array had been visited. A more thorough inspection of the vessels was made after Test "A" than test "B" because in the majority of ships power was available and the inspectors were not limited in time by the presence of radioactivity material. The same inspection plan was followed after the underwater detonation of Test "B", but the time allowed for inspections aboard the target ships was designated by the monitors of the Radiological Safety Section. This time permitted to inspectors aboard the target ships varied from 3/4 of an hour to 6 hours. These figures quoted were for open deck areas and not necessarily meant for below deck spaces, which in some instances ranged as high as 24 hours depending upon the amount of radioactive cascade that had seeped below decks. Power was furnished on several of the target ships, such as the NEW YORK, NEVADA, and PENNSYLVANIA, by sea going tugs but in the majority of cases the post-"B" inspections were limited to visual and hand operation, because of the limited time aboard and the lack of power.

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TEST "A"

Large Caliber Guns

<u>Type of Turret</u>	<u>No. of Turrets</u>	<u>Ship</u>		<u>Approximate Yards</u>
12"/50 Two Gun	6	ARKANSAS	BB	400
14"/45 Tripple Gun	2	NEVADA	BB	600
14"/45 Two Gun	2	NEVADA	BB	600
14"/45 Tripple Gun	4	PENNSYLVANIA	BB	1800
14"/45 Two Gun	5	NEW YORK	BB	1900
43.5 CM Two Gun	4	NAGATO	BB	900
8"/55 Tripple Mount	2	PENSACOLA	CA	600
8"/55 Two Gun Mount	2	PENSACOLA	CA	600
8"/55 Tripple Mount	2	SALT LAKE CITY	CA	1000
8"/55 Two Gun Mount	2	SALT LAKE CITY	CA	1000
20.3 CM Two Gun Turrets	4	PRINZ EUGEN	CA	1000

Intermediate Caliber Guns

5"/51 Single - Air Castle	6	ARKANSAS	BB	400
5"/38 Single - Open	1	CRITTENDEN	APA	500
5"/38 Twin - Closed	4	NEVADA	BB	600
5"/25 Single - Open	4	PENSACOLA	CA	600
5"/38 Single - Closed	3	HUGHES	DD	800
5"/38 Single - Open	1	HUGHES	DD	800
5"/38 Single - Open	1	DAWSON	APA	900
5"/38 Single - Closed	4	RHIND	DD	1000
5"/38 Single - Closed	2	RALPH TALBOT	DD	1200
5"/38 Single - Open	2	RALPH TALBOT	DD	1200
5"/38 Single - Closed	2	STACK	DD	1200
5"/38 Single - Open	2	STACK	DD	1200
5"/38 Single - Open	1	BARROW	APA	1300
5"/38 Single - Open	1	BANNER	APA	1400
5"/38 Single - Open	1	FALLON	APA	1400
5"/38 Single - Closed	2	WILSON	DD	1600
5"/38 Single - Open	2	WILSON	DD	1600
5"/38 Twin - Closed	4	PENNSYLVANIA	BB	1800
5"/51 Single - Air Castle	6	NEW YORK	BB	1900
5"/38 Single - Open	1	CARTERET	APA	2000
5"/38 Single - Closed	3	WAINWRIGHT	DD	2200
5"/38 Single - Open	1	WAINWRIGHT	DD	2200

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TEST "A"

Intermediate Caliber Guns
(Cont'd)

<u>Type of Turret</u>	<u>No. of Turrets</u>	<u>Ship</u>		<u>Approximate</u> <u>Yards</u>
5"/38 Single - Open	1	BRACKEN	APA	2200
5"/38 Single - Closed	3	MUSTIN	DD	2400
5"/38 Single - Open	1	MUSTIN	DD	2400
5"/38 Single - Open	1	FILLMORE	APA	2500
5"/38 Twin - Closed	2	SARATOGA	CV	2700
5"/38 Single - Open	4	SARATOGA	CV	2700
5"/38 Single - Open	1	GASCONADE	APA	2800
5"/38 Single - Closed	3	MUGFORD	DD	2900
5"/38 Single - Open	1	MUGFORD	DD	2900
5"/38 Single - Open	1	CATRON	APA	2900
5"/38 Single - Open	4	CONYNGHAM	DD	3100
5"/38 Single - Open	1	CORTLAND	APA	3200
5"/38 Single - Closed	3	MAYRANT	DD	3600
5"/38 Single - Open	1	MAYRANT	DD	3600
5"/38 Single - Open	1	NIAGARA	APA	4000
3"/50 Single - Open	6	ARKANSAS	BB	400
3"/50 Single - Open	10	NEW YORK	BB	1900

Light Caliber Guns

<u>Type of Mount</u>	<u>No. of Mounts</u>	<u>Ship</u>		<u>Approximate</u> <u>Yards</u>
40 MM Quad	2	PENSACOLA	CA	600
40 MM Quad	1	SALT LAKE CITY	CA	1000
40 MM Quad	4	PENNSYLVANIA	BB	1800
40 MM Quad	6	SARATOGA	CV	2700
40 MM Twin	2	ARKANSAS	BB	400
40 MM Twin	2	CRITTENDEN	APA	500
40 MM Twin	2	NEVADA	BB	600
40 MM Twin	4	INDEPENDENCE	CVL	700
40 MM Twin	2	HUGHES	DD	800
40 MM Twin	2	DAWSON	APA	900
40 MM Twin	1	RALPH TALBOT	DD	1200
40 MM Twin	2	STACK	DD	1200
40 MM Twin	2	BARROW	APA	1300
40 MM Twin	2	BANNER	APA	1400

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TEST "A"

Light Caliber Guns
(Cont'd)

<u>Type of Mount</u>	<u>No. of Mounts</u>	<u>Ship</u>	<u>Approximate Yards</u>
40 MM Twin	2	FALLOM	APA 1400
40 MM Twin	2	WILSON	DD 1600
40 MM Twin	1	PENNSYLVANIA	BB 1800
40 MM Twin	2	NEW YORK	BB 1900
40 MM Twin	2	CARTERET	APA 2000
40 MM Twin	2	WAINWRIGHT	DD 2200
40 MM Twin	2	BRACKEN	APA 2200
40 MM Twin	2	MUSTIN	DD 2400
40 MM Twin	2	SARATOGA	CV 2700
40 MM Twin	2	GASCONADE	APA 2800
40 MM Twin	2	MUGFORD	DD 2900
40 MM Twin	2	CATRON	APA 2900
40 MM Twin	2	CONYNGHAM	DD 3100
40 MM Twin	2	CORTLAND	APA 3200
40 MM Twin	2	MAYRANT	DD 3600
40 MM Twin	2	NIAGARA	APA 4000
40 MM Single	1	SKATE	SS 400
40 MM Single	5	PRINZ EUGEN	CA 1000
40 MM Single	1	DENTODA	SS 2100
20 MM Quad	5	PRINZ EUGEN	CA 1000
20 MM Twin	4	PENSACOLA	CA 600
20 MM Twin	9	NEVADA	BB 600
20 MM Twin	8	PENNSYLVANIA	BB 1800
20 MM Twin	2	TUNA	SS 2200
20 MM Twin	2	SARATOGA	CV 2700
20 MM Single	8	ARKANSAS	BB 400
20 MM Single	4	CRITTENDEN	APA 500
20 MM Single	4	INDEPENDENCE	CVL 700
20 MM Single	4	HUGHES	DD 800
20 MM Single	4	DAWSON	APA 900
20 MM Single	8	SALT LAKE CITY	CA 1000
20 MM Single	4	BRULE	APA 1000
20 MM Single	4	RALPH TALBOT	DD 1200
20 MM Single	4	STACK	DD 1200

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TEST "A"

Light Caliber Guns
(Cont'd)

<u>Type of Mount</u>	<u>No. of Mounts</u>	<u>Ship</u>	<u>Approximate</u> <u>Yards</u>
20 MM Single	4	BARROW	APA 1300
20 MM Single	4	BANNER	APA 1400
20 MM Single	4	FALLON	APA 1400
20 MM Single	4	WILSON	DD 1600
20 MM Single	4	BRISCOE	APA 1700
20 MM Single	2	BUTTE	APA 2000
20 MM Single	4	CARTERET	APA 2000
20 MM Single	4	WAINWRIGHT	DD 2200
20 MM Single	4	BRACKEN	APA 2200
20 MM Single	3	MUSTIN	DD 2400
20 MM Single	1	PILOTFISH	SS 2400
20 MM Single	2	FILMORE	APA 2500
20 MM Single	10	SARATOGA	CV 2700
20 MM Single	2	BLADEN	APA 2800
20 MM Single	4	GASCONADE	APA 2800
20 MM Single	4	MUGFORD	DD 2900
20 MM Single	4	CATRON	APA 2900
20 MM Single	4	CONYNGHAM	DD 3100
20 MM Single	2	GENEVA	APA 3100
20 MM Single	2	CORTLAND	APA 3200
20 MM Single	4	MAYRANT	DD 3600
20 MM Single	4	NIAGARA	APA 4000

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DAMAGE TO LARGE CALIBER GUNS:

U.S.S. ARKANSAS (BB-33) - Approximately 400 yards from center of
Detonation.

Armament: Six 12"/50 - Two Gun Turrets.

Turrets #1, 2, 3, 4, 5 and 6.

There was no damage to the equipment of turrets #1, 2, 3, 5 and 6 as a result of Test "A". However a detailed inspection of the right gun in turret #4 revealed that the forward piece of the right trunnion block, which holds the cap square on the forward side was broken by shock. Photographs AACR-234-1991-1 and AACR-234-1991-2 show this damage quite clearly. This gun could no be fired nor could the damage be repaired by the ship's force. The turret was movable normally in train and the gun could be moved in elevation. The turrets were conditioned as follows:

<u>TURRET</u>	<u>CONDITION</u>	<u>ELEVATION</u>	<u>TRAIN</u>
1	Zebra	Load Position	0°
2	Yoke	Load Position	0°
3	Zebra	Load Position	180°
4	Yoke	15°	090°
5	Zebra	Load Position	180°
6	Yoke	Load Position	180°

U.S.S. NEVADA (BB-36) - Approximately 600 yards from center of
Detonation.

Armament: Two 14"/45 Triple Gun Turrets.
Two 14"/45 Two Gun Turrets.

Turrets #1, 2, 3, and 4.

There was no damage to this equipment which would impair normal operation. The leather bloomers on turrets #1 and 2 were intact except for the bloomers on the left gun turret #1 which were torn. The canvas bloomers on turrets #3 and 4 were destroyed. The left rangefinder port cover on turret #2 was "dished in", but this damage did not prevent the operation of the rangefinder port. The vent intake pipe and turret drip pan under the overhang of turret #3 were caved in. The turrets were conditioned as follows:

<u>TURRET</u>	<u>CONDITION</u>	<u>ELEVATION</u>	<u>TRAIN</u>
1	Zebra	0°	0°
2	Yoke	0°	0°
3	Zebra	0°	180°
4	Yoke	0°	180°

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DAMAGE TO LARGE CALIBER GUNS:

U.S.S. PENNSYLVANIA (BB-38) - Approximately 1800 yards from center of Detonation.

Armament: Four 14"/45 Tripple Gun Turrets.

Turrets #1, 2, 3, and 4.

There was no damage to this equipment as a result of Test "A". The turrets were conditioned as follows:

<u>TURRET</u>	<u>CONDITION</u>	<u>ELEVATION</u>	<u>TRAIN</u>	<u>BREACH</u>
1	Zebra	Normal Stowage	0°	R.G. Open
2	Yoke	Normal Stowage	0°	L.G. Open
3	Zebra	20°	180°	Closed
4	Yoke	Normal Stowage	180°	L.G. Open

U.S.S. NEW YORK (BB-34) - Approximately 1900 yards from center of Detonation.

Armament: Five 14"/45 Two Gun Turrets.

Turrets #1, 2, 3, 4, and 5.

There was no change in this equipment as a result of Test "A". The turrets were conditioned as follows:

<u>TURRET</u>	<u>CONDITION</u>	<u>ELEVATION</u>	<u>TRAIN</u>
1	Zebra	Loading Position	0°
2	Yoke	Loading Position	0°
3	Zebra	Loading Position	180°
4	Yoke	Loading Position	180°
5	Zebra	Loading Position	180°

U.S.S. NAGATO (BB-Ex Japanese) - Approximately 900 yards from center of Detonation.

Armament: Four 43.5 CM Two Gun Turrets.

This equipment was not operable prior to Test "A". No change in condition was determined after the test.

U.S.S. PENSACOLA (CA-24) - Approximately 600 yards from center of Detonation.

Two 8"/55 Tripple Mounts.
Two 8"/55 Twin Mounts.

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DAMAGE TO LARGE CALIBER GUNS:

U.S.S. PENSACOLA (CA-24)(Cont'd).

Mount #1 was completely operable after Test "A".

Mount #2 was completely operable after Test "A", but the interior had considerable damage to light gear attached to bulkheads such as sound power phones, light fixtures and buckets. The gas seals for the pointers and trainer sight ports were blown out.

Mount #3 had two guns rendered temporarily inoperative. The differential pistons on the left and center guns were fully extended due to lack of air pressure thus rendering the guns inoperative and examination revealed that the counter-recoil system on the center gun was undamaged and that the restoration of air pressure made the gun fully operative. On the left gun, the diaphragm in the differential cylinder was found to be ruptured and required about 30 minutes for repairs by the ship's force.

The rammer for the left gun which was fully extended into the open breech was forced back within 42" of its "secure" position but remained operable. One high capacity projectile was knocked off the auxiliary tray.

Mount #4 was completely operable after Test "A", but the cover was blown off the auxiliary firing battery boxes, sample powder bottles were smashed, the blower ducts were dented and the door was blown off the pointers station. The mounts were conditioned as follows:

<u>MOUNT</u>	<u>CONDITION</u>	<u>ELEVATION</u>	<u>TRAIN</u>
1	Zebra	5°	0°
2	Yoke	5°	0°
3	Zebra	5°	180°
4	Yoke	5°	180°

U.S.S. SALT LAKE CITY (CA-25) - Approximately 1000 yards from center of Detonation.

Armament: Two 8"/55 Tripple Mounts.
Two 9"/55 Twin Mounts.

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DAMAGE TO LARGE CALIBER GUNS:

U.S.S. SALT LAKE CITY (CA-25) (Cont'd).

Mount #1 showed signs of having received a very heavy blast as the gas seals on both the left and right side were blown out and the gun slide was shifted to the right resulting in both trunnions and deck lugs being sprung. However, this damage did not affect the operation of the mount in elevation or train. Photographs AACR-76-1926-12, AACR-76-1927-1, 2, 3, 4, and 5 clearly show the damage to the trunnions and deck lugs. A few bolts of the gun port gas seal were sheared off.

Mount #2 sustained no damage other than the left gun port gas seal blown out.

Mount #3 and 4 - There was no damage to this equipment as a result of Test "A". Photographs AACR-76-1926-10, 11, AACR-76-1927-6, 7, 8, and 9 show the damage to the weather seals. The mounts were conditioned as follows:

<u>MOUNT</u>	<u>CONDITION</u>	<u>ELEVATION</u>	<u>TRAIN</u>
1	Zebra	5°	0°
2	Yoke	5°	0°
3	Zebra	5°	180°
4	Yoke	5°	180°

U.S.S. FRINZ EUGEN (CA-Ger) - Approximately 1000 yards from the center of Detonation.

Armament: Four 20.3 CM Two Gun Turrets.

There was no damage to this equipment as a result of Test "A".

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DAMAGE TO INTERMEDIATE CALIBER GUNS:

U.S.S. ARKANSAS (BB-33) - Approximately 400 yards from center of Detonation.

Armament: Six 5"/51 Single Guns.

5"/51 Mounts (located in port and starboard air-castle).

There was no damage to guns #1, 2, 4, 5 and 6 as a result of Test "A". Gun #3 had a bent train handwheel which prevented operation, but this damage could easily be repaired by the ship's force. The train indicator and the trainer's telescope were smashed. This damage was caused by the air-castle protective shield being blown upward by the blast. The mounts were conditioned as follows:

<u>MOUNT</u>	<u>TRAIN</u>	<u>ELEVATION</u>	<u>BREACH</u>
1	Normal Stowage	Full Depression	Open
2	Normal Stowage	0	Closed
3	Normal Stowage	Full Elevation	Open
4	Normal Stowage	0	Closed
5	Normal Stowage	Full Depression	Closed
6	Normal Stowage	Full Depression	Closed

U.S.S. CRITTENDEN (APA-77) - Approximately 500 yards from center of Detonation.

Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "A".

U.S.S. NEVADA (BB-36) - Approximately 600 yards from center of Detonation.

Armament: Four 5"/38 dual purpose twin mounts.

5"/38 twin mounts (located at frame 55 02 level port and starboard, and frame 85 02 level port and starboard).

Forward starboard mount (frame 55). This mount suffered no damage except a rupture of the oil lines leading from the expansion tank to the sump tank in the train unit which resulted in disabling the mount in train. When the train unit was energized, hydraulic oil flowed across the deck on the trainers side of the mount. The evidence of green paint from the trainer's platform on the oil lines at the point of rupture substantiates the belief that the trainer's platform was torn loose from the side plate and smashed against the side of the carriage thus rupturing the oil lines.

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DAMAGE TO INTERMEDIATE CALIBER GUNS:

U.S.S. NEVADA (BB-36) (Cont'd).

The two bolts that secured the platform to the side plate were found on the floor plates of the mount with threads stripped, further substantiating the supposition that the platform was torn loose from the side plate. The remaining tapped holes in the side plate were rusted and showed no evidence of use. The Boston type canvas bloomers were destroyed and the bloomer frames were warped and twisted across the gun barrels.

Forward Port Mount (frame 65). The mount suffered no damage that would prevent operation. The oil lines from the expansion tank to the sump tank in the train unit were pinched but not ruptured by a blow from the trainers platform as was the case with the previous mount. However, in this case the platform was firmly secured to the side plate. The water-proof case of the solenoid for the elevation gear was pierced by an unknown object at the top-face of the case directly below the pointers station but the solenoid was undamaged.

After Port Mount (frame 85). This mount was rendered inoperative in train by a closure in the oil lines from the expansion tank to the sump tank in the training unit. This was again caused by a blow from the trainers platform as in the previous mounts but in this case the platform was not secured to the side plate and the rusted tap holes in the side plate showed no evidence of recent usage. The bolts that secure the bracket of the unit which contains the power failure valve, the solenoid, the high pressure filters and the trainers seat were sheared off at the flange face, where it secures to the control unit of the "A" end. (See Page 12 of OP1103). When the training unit was started, the closure in the oil lines caused the oil to back up into the train indicator unit where the glass shattered from the pressure. The oil grounded out all electrical circuits to this unit. The canvas bloomers and the canvas seals on the sight ports were destroyed.

After Starboard Mount (frame 85). This mount was completely operable. The oil lines from the expansion tank to the sump tank in the train unit were again pinched by a blow from the trainers platform but were not seriously damaged. The platform was securely bolted to the side plate. The glass face on the air pressure gauge was shattered. The Boston type canvas bloomers were destroyed and the metal frames were warped around the gun barrels.

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DAMAGE TO INTERMEDIATE CALIBER GUNS:

U.S.S. NEVADA (BB-36) (Cont'd).

The mounts were conditioned as follows:

<u>MOUNT</u>	<u>CONDITION</u>	<u>ELEVATION</u>	<u>TRAIN</u>
1	Zebra	85°	Right Limit Stop
2	Yoke	0°	0°
7	Zebra	85°	180°
8	Yoke	45°	Left Limit Stop

U.S.S. PENSACOLA (CA-24) - Approximately 600 yards from center of Detonation.

Armament: Four 5"/25 Single Mounts.

5"/25 Mounts (located at frame 85 and 91 Port and Starboard).

The mounts were all completely operable after Test "A".

The mounts were conditioned as follows:

<u>MOUNT</u>	<u>ELEVATION</u>		<u>TRAIN</u>	
	<u>BEFORE</u>	<u>AFTER</u>	<u>BEFORE</u>	<u>AFTER</u>
5	0°	7.5°	160°	190.2°
6	-5°	-5°	0°	1.25°
7	85°	75°	180°	194.8°
8	75°	75°	185°	189°

U.S.S. HUGHES (DD-410) - Approximately 800 yards from center of Detonation.

Armament: Four 5"/38 Single Mounts.

5"/38 Mounts Numbers 1, 2, 3, and 4.

The sides and back of closed mounts numbers 1, 2 and 4 were dished in but, this did not prevent normal operation. All mounts were fully operable. The canvas bloomers on mount numbers 1, 2 and 3 were destroyed. Mount number 3 is an open mount. The mounts were conditioned as follows:

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DAMAGE TO INTERMEDIATE CALIBER GUNS:

U.S.S. HUGHES (DD-410) (Cont'd).

<u>MOUNT</u>	<u>CONDITION</u>	<u>ELEVATION</u>	<u>TRAIN</u>
1	Zebra	85°	0°
2	Yoke	30°	0°
3		-5°	180°
4	Zebra	75°	180°

U.S.S. DAWSON (APA-79) - Approximately 900 yards from center of Detonation.

Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "A".

U.S.S. RHIND (DD-404) - Approximately 1000 yards from center of Detonation.

Armament: Four Single Mounts.

Mount No. 1 was completely operable after Test "A" but the canvas bloomers were destroyed, the gun port seals were destroyed, the mount access doors were warped and could not be closed and the starboard side shield was "dished in".

Mount No. 2 was in a normal operating condition after Test "A". The interior shows considerable damage to gear attached to the gun shield, i.e., the selector switch on the after bulkhead was blown apart. The starboard gun shield was "dished in" about 4" while the rear face of the arc shield was "dished in" about 2". The metal spray shield protecting the sump tank was torn loose and interfered with train. This spray shield was easily removed, thus restoring full train.

Mount No. 3 - There was no damage to this equipment as a result of Test "A". The mounts were conditioned as follows:

<u>MOUNT</u>	<u>CONDITION</u>	<u>ELEVATION</u>	<u>TRAIN</u>
1	Zebra	75°	0°
2	Yoke	-5°	340°
3	Zebra	30°	120°
4	Yoke	85°	180°

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DAMAGE TO INTERMEDIATE CALIBER GUNS:

U.S.S. RALPH TALBOT (DD-390) - Approximately 1200 yards from center of Detonation.

Armament: Four 5"/38 Single Mounts.

All mounts were operable after Test "A". The rear shield of mount number 2 was "dished in". The power panel in mount number 3 was distorted outboard about 25°.

U.S.S. STACK (DD-406) - Approximately 1200 yards from center of Detonation.

Armament: Four 5"/38 Single Mounts.

There was no damage to this equipment as a result of Test "A".

U.S.S. BARROW (APA-61) - Approximately 1300 yards from center of Detonation.

Armament: One 5"/38 Single Mount.

5"/38 Single Mount (located at frame 157 centerline, upper deck). This unit had a broken shaft in the handwheel bracket and could not be trained in manual or local.

U.S.S. BANNER (APA-60) - Approximately 1400 yards from center of Detonation.

Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "A".

U.S.S. FALLON (APA-81) - Approximately 1400 yards from center of Detonation.

Armament: One 5"/38 Single Mount.

There was no change in this equipment as a result of Test "A".

U.S.S. WILSON (DD-408) - Approximately 1600 yards from center of Detonation.

Armament: Four 5"/38 Single Mounts.

There was no damage to this equipment as a result of Test "A".

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DAMAGE TO INTERMEDIATE CALIBER GUNS:

U.S.S. PENNSYLVANIA (BB-38) - Approximately 1800 yards from center of Detonation.

Armament: Four 5"/38 Twin Mounts.

5"/38 Twin Mounts Numbers 1, 2, 7 and 8 (located at frame 62 and 87 superstructure deck port and starboard.) There was no damage to this equipment as a result of Test "A". The mounts were conditioned as follows:

<u>MOUNT</u>	<u>CONDITION</u>	<u>ELEVATION</u>	<u>TRAIN</u>
1	Zebra	85°	Right Limit Stop
2	Yoke	0°	0°
7	Zebra	Full Depression	180°
8	Yoke	45°	Left Limit Stop

U.S.S. NEW YORK (BB-34) - Approximately 1900 yards from center of Detonation.

Armament: Six 5"/51 Single Mounts.

5"/51 mounts (located in port and starboard air-castles). There was no damage to this equipment as a result of Test "A". The mounts were conditioned as follows:

<u>MOUNT</u>	<u>ELEVATION</u>	<u>TRAIN</u>	<u>BREECH</u>
1	-3°	Normal Stowage	Open
2	5°	Normal Stowage	Closed
3	0°	Normal Stowage	Open
4	0°	Normal Stowage	Closed
5	Full Elevation	Normal Stowage	Closed
6	Full Elevation	Normal Stowage	Open

U.S.S. CARTERET (APA-70) - Approximately 2000 yards from center of Detonation.

Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "A".

U.S.S. WAINWRIGHT (DD-419) - Approximately 2200 yards from center of Detonation.

Armament: Four 5"/51 Single Mounts.

There was no damage to this equipment as a result of Test "A".

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DAMAGE TO INTERMEDIATE CALIBER GUNS:

U.S.S. BRACKEN (APA-64) - Approximately 2200 yards from center of Detonation.

Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "A".

U.S.S. MUSTIN (DD-413) - Approximately 2400 yards from center of Detonation.

Armament: Four 5"/38 Single Mounts.

There was no damage to this equipment as a result of Test "A".

U.S.S. FILLMORE (APA-83) - Approximately 2500 yards from center of Detonation.

Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "A".

U.S.S. SARATOGA (CV-3) - Approximately 2700 yards from center of Detonation.

Armament: Two 5"/38 Twin Mounts.
Four 5"/38 Single Mounts.

Mounts 5 and 7 (located at frames 56 and 124 flight deck and 01 level starboard). There was no damage to this equipment attributable to Test "A". There was, however, a bearing failure in the elevating unit due to improper maintenance lubrication which prevented elevating the guns after the test.

NOTE:- This mount was operating during Test "A" and trained toward the NEVADA. Single Mounts number 3, 4, 9 and 10 (Located flight deck spenson port and starboard). There was no damage to this equipment as a result of Test "A".

U.S.S. GASCONADE (APA-85) - Approximately 2800 yards from center of Detonation.

Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "A".

U.S.S. MUGFORD (DD-389) - Approximately 2900 yards from center of Detonation.

Armament: Four 5"/38 Single Mounts.

There was no damage to this equipment as a result of Test "A".

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DAMAGE TO INTERMEDIATE CALIBER GUNS:

U.S.S. CATRON (APA-71) - Approximately 2900 yards from center of
Detonation.
Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "B".

U.S.S. CONYNGHAM (DD-371) - Approximately 3100 yards from center of
Detonation.
Armament: Four 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "A".

U.S.S. CORTLAND (APA-75) - Approximately 3200 yards from center of
Detonation.
Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "A".

U.S.S. MAYRANT (DD-402) - Approximately 3600 yards from center of
Detonation.
Armament: Four 5"/38 Single Mounts.

There was no damage to this equipment as a result of Test "A".

U.S.S. NIAGARA (APA-87) - Approximately 4000 yards from center of
Detonation.
Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "A".

U.S.S. ARKANSAS (BB-33) - Approximately 400 yards from center of
Detonation.
Armament: Six 3"/50 Single Mounts.

3"/50 Mounts (located at frame 42 boat deck port and starboard and
at frame 99 main deck port and starboard). There was no damage to
this equipment as a result of Test "A".

The mounts were conditioned as follows:

<u>MOUNT</u>	<u>TRAIN</u>	<u>ELEVATION</u>
1	0°	Full Depression.
2	0°	20°
3	135°	0°
4	135°	Full Depression.

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U.S.S. NEW YORK (BB-34) - Approximately 1900 yards from center of Detonation.

Armament: Ten 3"/50 Single Mounts.

3"/50 Mounts (located at frames 48, 54, and 59 boat deck port and starboard and at frames 100 and 108 main deck port and starboard). There was no damage to the equipment as a result of Test "A".

The mounts were conditioned as follows:

<u>MOUNT</u>	<u>ELEVATION</u>	<u>TRAIN</u>
1	-15°	0°
2	5°	Normal Stowage
3	0°	0°
4	0°	Normal Stowage
5	0°	Normal Stowage
6	0°	Normal Stowage
7	0°	Normal Stowage
8	0°	Normal Stowage
9	Full Elevation	180°
10	Full Elevation	180°

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DAMAGE TO LIGHT CALIBER GUNS

U.S.S. ARKANSAS (BR 33) - Approximately 400 yards from Center of Detonation.
Two (2) 40MM Twin Mounts.

Armament: Eight (8) 20MM Single Mounts.

40MM Twin Mounts (located at frame 60, Boat Deck, Port and Starboard).

The units operated normally except that in automatic they were sluggish in train when moved to port. It is believed that this action is due to faulty wiring rather than blast damage as these mounts were sluggish before Test "A".

20MM Single Mounts (located on port and starboard side Mainmast and lower Signal Bridge).

There was no damage to the Gun Mechanisms or stands as a result of Test "A". The magazines of Guns Nos. 5, 7, and 8 were "dished in" and the shoulder rest of Gun No. 6 was slightly distorted. The barrel of gun #8 which was bent to the right appeared to have been struck by flying debris. This was concluded from the flat surface on the bell end of the barrel.

U.S.S. SKATE (SS 305) - Approximately 400 yards from Center of Detonation.

Armament: One (1) 40MM Single Mount.

The damage to this equipment as a result of Test "A" is described below:

The blast effect caused the carriage to be bent downward and forward. This action caused the angle of elevation and depression to change from the normal 15° to 89° to approximately 30° to 74°. These findings were determined by visual inspection because the unit was restricted in elevation to 3/4 of a revolution of the handwheel. Photograph AACR-76-1937-10 shows the demolished conning tower completely wrapped around the gun. The gun barrel and sight bar can be seen to the left of the Data Board. Photograph AACR-76-1927-12 shows the foundation of the mount remaining intact. The case ejecting chutes can be seen in the upper center of the photograph. The mount has been removed and forwarded to the Naval Gun Factory for further study.

U.S.S. CRITTENDEN (APA 77) - Approximately 500 yards from Center of Detonation.

Two (2) 40MM Twin Mounts.

Armament: Four (4) 20MM Single Mounts.

40MM Twin Mounts - There was no damage to the equipment as a result of Test "A".

S-E-C-R-E-T

Enclosure (D) to Director Ship Material Serial 001500.

S-E-C-R-E-T

DAMAGE TO LIGHT CALIBER GUNS (Cont'd)

U.S.S. CRITTENDEN (APA 77) - Approximately 500 yards from Center of Detonation.
(Cont'd)

20MM Single Mounts (located at frame 63 and 107, Signal Bridge and Super-structure, Port and Starboard).

Mounts Nos. 1, and 7 - No damage. Mount No. 2 was immovable in train as the splinter shield was blown back against the stand. Mount No. 8 would not train nor elevate because the firing cut-out cam roller was jammed against the cut-out cam.

U.S.S. PENSACOLA (CA 24) - Approximately 600 yards from Center of Detonation.
Two (2) 40MM Quad Mounts.
Armament: Four (4) 20MM Twin Mounts.

40MM Quad Mounts (located at Frame 97, port and starboard).

Mount No. 1 was operating during the test but heavy damage to the director and the burning out of the primary side of the local control switch transformer made the mount inoperative in power drive. The mount could easily be made operable in power drive if sufficient spares were available. The mount can be operated and fired manually. The glass in the "B" end generator box was broken.

Mount No. 2 was used to test an experimental non-inflammable oil. This oil apparently had "waxed up" the zeroing pistons and the stroking pistons in the elevation power unit thus making it inoperative. The unit could be repaired by cleaning and refilling with normal hydraulic oil. The mount was otherwise completely operable. The glass in the "B" end generator box was broken.

20MM Twin Mounts (located at frames 40 and 105; port and starboard).

There was no change to this equipment as a result of Test "A".

U.S.S. NEVADA (BB 36) - Approximately 600 yards from Center of Detonation.
Two (2) 40MM Twin Mounts.
Armament: Eight (8) 20MM Twin Mounts.

40MM Twin Mounts (located at frame 70, O2 level, port and starboard).

Port Mount: This mount was completely operable. The glass plate in the elevation lag meter was shattered. Starboard Mount: This mount was completely operable. The glass plate in the train lag meter was shattered. The power switch for the training unit located on a panel in the clipping room stuck, but was easily freed.

S-E-C-R-E-T

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DAMAGE TO LIGHT CALIBER GUNS (Cont'd)

U.S.S. NEVADA (BB 36) (Cont'd) - Approximately 600 yards from Center of Detonation.

20MM Twin Mounts (located at frames 47 and 49, port and starboard and at frame 143 starboard) were undamaged. The mount at frames 124, starboard and 143, port were "frozen" in train due to the firing cut-out cam roller being jammed against the firing cut-out cam.

U.S.S. INDEPENDENCE (CVL 22) - Approximately 700 yards from Center of Detonation.

Four (4) 40MM Twin Mounts.

Armament:

Four (4) 20MM Single Mounts.

40MM Twin Mounts Nos. 3, 4, 8 and 9 (located on Flight Deck sponsons port and starboard.

The damage to this equipment as a result of Test "A" is described below:

Mount No. 3 - The trainers open sight, the ready service ammunition rack and handle rail were damaged by flying debris.

Mount No. 4 - The automatic loaders were bent and would not operate. The gun barrels were so bent that the bore gauge could not be passed. The elevation securing pin which was in the "in" position was sheared off and the gun depressed into the positive stop.

Mount No. 8 - The automatic loaders were bent and would not operate. The elevation securing pin which was in the "in" position was sheared off and the gun depressed into the positive stop. This mount could not be operated in train due to a distorted sponson.

Mount No. 9 - The trunnions of this gun were spread outward in such a manner as to permit the gun mechanism to fall free. Inspection of this mount revealed markings on the right trunnion cap square and it is believed that these markings were caused by the gear teeth of the elevating arc. The top of the cap square was indented in such a manner and the lower side of the right trunnion threads flatten in such a manner as to lead to the conclusion that these impressions were made when the gun mechanism was blown free of its secured position by the blast. The trunnion apparently struck the top of the cap square. Photographs AACR-92-1779-6,7,9,10,11,12; AACR-92-1780-1,3,4,5,6,7,9,10; AACR-92-1781-7,8,9, and 10; AACR-81-1670-7,8, and 9, show the spreading of the trunnions and the position of the gun mechanism as found upon inspecting this vessel. This gun has been removed and forwarded to the Naval Gun Factory for further study.

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S-E-C-R-E-T

DAMAGE TO LIGHT CALIBER GUNS (Cont'd)

U.S.S. INDEPENDENCE (CVL 22) (Cont'd) - Approximately 700 yards from Center of Detonation.

20MM Single Mounts Nos. 1, 2, 4, and 6 (Located at frames 19 and 21 Flight Deck Sponsons).

Mount No. 1 - The shoulder rests and sight were missing. The cradle was bent slightly.

Mounts Nos. 2 and 4 - Guns and sponsons were missing.

Mount No. 6 - No damage.

U.S.S. HUGHES (DD 410) - Approximately 800 yards from Center of Detonation.
Two (2) 40MM Twin Mounts.

Armament: Four (4) 20MM Single Mounts.

40MM Mounts Nos. 1 and 2 - There was no damage to this equipment as a result of test "A".

U.S.S. DAWSON (APA 79) - Approximately 900 yards from Center of Detonation.
Two (2) 40MM Twin Mounts.

Armament: Four (4) 20MM Single Mounts.

40MM Twin Mounts - There was no damage to this equipment as a result of Test "A".

20MM Single Mounts - There was no damage to this equipment as a result of Test "A".

U.S.S. SALT LAKE CITY (CA 25) - Approximately 1000 yards from Center of Detonation.

Armament; One (1) 40MM Quad Mount.
Eight (8) 20MM Single Mounts.

40MM Quad Mount (located at frame 133 Main Deck Starboard)

There was no damage to the equipment as a result of Test "A", except for the elevation starting switch which was loosened.

20MM Single Mounts (located at frame 39, 02 level, frames 105 and 107, 01 level and frame 47, 05 level).

There was no damage to the equipment as a result of Test "A".

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S-E-C-R-E-T

DAMAGE TO LIGHT CALIBER GUNS (Cont'd)

U.S.S. BRULE (APA 66) - Approximately 1000 yards from Center of Detonation.
Armament: Four (4) 20MM Single Mounts.

There was no damage to the equipment as a result of Test "A".

U.S.S. PRINZ EUGEN (IX-300) - Approximately 1000 yards from Center of Detonation.
Four (4) 10.5 CM Twin Mounts.
Armament: Five (5) 40MM Single Mounts.
Five (5) 20MM Quad Mounts.

There was no damage to the equipment as a result of Test "A".

U.S.S. RALPH TALBOT (DD 390) - Approximately 1200 yards from Center of Detonation.
One (1) 40MM Twin Mount
Armament: Four (4) 20MM Single Mounts

40MM Twin Mounts - There was no damage to the equipment as a result of Test "A".

20MM Single Mounts - There was no damage to the equipment as a result of Test "A".

U.S.S. STACK (DD 406) - Approximately 1200 yards from Center of Detonation.
Two (2) 40MM Twin Mounts.
Armament: Four (4) 20MM Single Mounts.

40MM Twin Mounts - There was no damage to the equipment as a result of Test "A".

20MM Single Mounts - There was no damage to the equipment as a result of Test "A".

U.S.S. BARROW (APA 61) - Approximately 1300 yards from Center of Detonation.
Two (2) 40MM Twin Mounts.
Armament: Four (4) 20MM Single Mounts.

40MM Twin Mounts - There was no damage to the equipment as a result of Test "A".

20MM Single Mounts - There was no damage to the equipment as a result of Test "A".

S-E-C-R-E-T

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S-E-C-H-E-T

DAMAGE TO LIGHT CALIBER GUNS (Cont'd)

U.S.S. BANNER (APA 60) - Approximately 1400 yards from Center of Detonation.
Two (2) 40MM Twin Mounts

Armament: Four (4) 20MM Single Mounts.

40MM Twin Mounts - There was no damage to the equipment as a result of Test "A".

20MM Single Mounts - There was no damage to the equipment as a result of Test "A".

U.S.S. FALLON (APA 81) - Approximately 1400 yards from Center of Detonation.
Two (2) 40MM Twin Mounts.

Armament: Four (4) 20MM Single Mounts.

40MM Twin Mounts - There was no damage to the equipment as a result of Test "A".

20MM Single Mounts - There was no damage to the equipment as a result of Test "A".

U.S.S. WILSON (DD 408) - Approximately 1600 yards from Center of Detonation.
Two (2) 40MM Twin Mounts

Armament: Four (4) 20MM Single Mounts

40MM Twin Mounts - There was no damage to the equipment as a result of Test "A".

20MM Single Mounts - There was no damage to the equipment as a result of Test "A".

U.S.S. BRISCOE (APA 65) - Approximately 1700 yards from Center of Detonation
Armament: Four (4) 20MM Single Mounts.

There was no damage to the equipment as a result of Test "A".

U.S.S. PENNSYLVANIA (BB 38) - Approximately 1800 yards from Center of Detonation.
Four (4) 40MM Quad Mounts.

Armament: One (1) 40MM Twin Mounts.

Eight (8) 20MM Twin Mounts.

One (1) .50 Caliber Quad (Maxon)

There was no damage to the equipment as a result of Test "A".

U.S.S. NEW YORK (BB 34) - Approximately 1900 yards from Center of Detonation.
Two (2) 40MM Twin Mounts.

Armament: Six (6) 20MM Twin Mounts.

There was no damage to the equipment as a result of Test "A".

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S-E-C-R-E-T

DAMAGE TO LIGHT CALIBER GUNS (Cont'd)

U.S.S. BUTTE (APA 68) - Approximately 2000 yards from Center of Detonation.

Armament: Two (2) 20MM Single Mounts.

There was no damage to the equipment as a result of Test "A".

U.S.S. CARTERET (APA 70) - Approximately 2000 yards from Center of Detonation.

Two (2) 40MM Twin Mounts.

Armament: Four (4) 20MM Single Mounts.

There was no damage to the equipment as a result of Test "A".

U.S.S. DENTUDA (SS 335) - Approximately 2100 yards from Center of Detonation.

Armament: One (1) 40MM Single Mount

There was no damage to the equipment as a result of Test "A".

U.S.S. WAINWRIGHT (DD 419) - Approximately 2200 yards from Center of Detonation.

Two (2) 40MM Twin Mounts

Armament: Four (4) 20MM Single Mounts

There was no damage to the equipment as a result of Test "A".

U.S.S. TUNA (SS 203) - Approximately 2200 yards from Center of Detonation.

Two (2) 20MM Twin Mounts.

Armament: Two (2) .50 Caliber Single Mounts.

There was no damage to the equipment as a result of Test "A".

U.S.S. BRACKEN (APA 64) - Approximately 2200 yards from Center of Detonation.

Two (2) 40MM Twin Mounts.

Armament: Four (4) 20MM Single Mounts.

There was no damage to the equipment as a result of Test "A".

U.S.S. MUSTIN (DD 413) - Approximately 2400 yards from Center of Detonation.

Two (2) 40MM Twin Mounts

Armament: Three (3) 20MM Single Mounts.

There was no damage to the equipment as a result of Test "A".

S-E-C-R-E-T

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S-E-C-R-E-T

DAMAGE TO LIGHT CALIBER GUNS (Cont'd)

U.S.S. PILOTFISH (SS 386) - Approximately 2400 yards from Center of Detonation.

Armament: One (1) 40MM Single Mount
One (1) 20MM Single Mount
One (1) .50 Caliber Single Mount

There was no damage to the equipment as a result of Test "A".

U.S.S. FILLMORE (APA 83) - Approximately 2500 yards from Center of Detonation.

Armament: Two (2) 20MM Single Mounts.

There was no damage to the equipment as a result of Test "A".

U.S.S. SARATOGA (CV 3) - Approximately 2700 yards from Center of Detonation.

Armament: Six (6) 40MM Quad Mounts
Two (2) 40MM Twin Mounts.
Ten (10) 20MM Single Mounts

There was no damage to the equipment as a result of Test "A".

U.S.S. BLADEN (APA 63) - Approximately 2800 yards from Center of Detonation.

Armament: Two (2) 20MM Single Mounts.

There was no damage to the equipment as a result of Test "A".

U.S.S. GASCONADE (APA 85) - Approximately 2800 yards from Center of Detonation.

Armament: Two (2) 40MM Twin Mounts
Four (4) 20MM Single Mounts

There was no damage to the equipment as a result of Test "A".

U.S.S. MUGFORD (DD 389) - Approximately 2800 yards from Center of Detonation.

Armament: Two (2) 40MM Twin Mounts
Four (4) 20MM Single Mounts

There was no damage to the equipment as a result of Test "A".

U.S.S. CATRON (APA 71) - Approximately 2900 yards from Center of Detonation.

Armament: Two (2) 40MM Twin Mounts
Four (4) 20MM Single Mounts

There was no damage to the equipment as a result of Test "A".

S-E-C-R-E-T

Enclosure (D) to Director Ship Material Serial 001500.

S-E-C-R-E-T

DAMAGE TO LIGHT CALIBER GUNS (Cont'd)

U.S.S. CONYNGHAM (DD 371) - Approximately 3100 yards from Center of Detonation.
Two (2) 40MM Twin Mounts
Armament: Four (4) 20MM Single Mounts

There was no damage to the equipment as a result of Test "A".

U.S.S. GENEVA (APA 86) - Approximately 3100 yards from Center of Detonation.
Armament: Two (2) 20MM Single Mounts

There was no damage to the equipment as a result of Test "A".

U.S.S. CORTLAND (APA 75) - Approximately 3200 yards from Center of Detonation.
Two (2) 40MM Twin Mounts.
Armament: Two (2) 20MM Single Mounts.

There was no damage to the equipment as a result of Test "A".

U.S.S. MAYRANT (DD 402) - Approximately 3600 yards from Center of Detonation.
Two (2) 40MM Twin Mounts.
Armament: Four (4) 20MM Single Mounts.

There was no damage to the equipment as a result of Test "A".

U.S.S. NIAGARA (APA 87) - Approximately 4000 yards from Center of Detonation.
Two (2) 40MM Twin Mounts.
Armament: Four (4) 20MM Single Mounts.

There was no damage to the equipment as a result of Test "A".

S-E-C-R-E-T

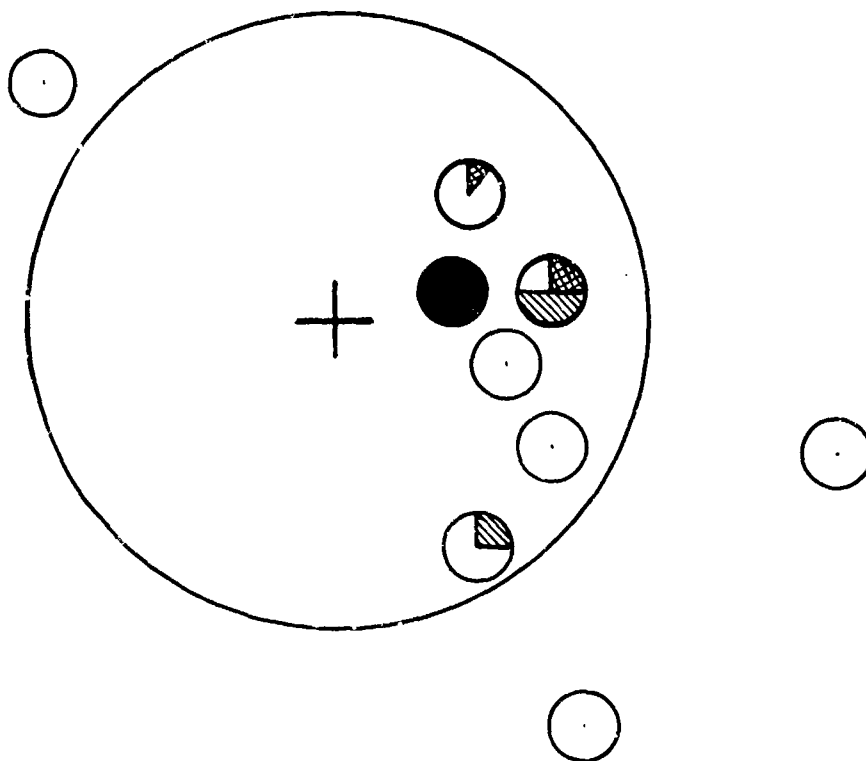
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SECRET

RANGE CIRCLE - 1000 YARDS RADIUS.

A



KEY

SUNK

PERCENT NOT OPERABLE

LIGHT OR
NO DAMAGE (%)

DAMAGED BUT OPERABLE (%)

8", 12" & 14" GUNS

TEST "A" MAJOR CALIBER MOUNTS & TURRETS-LOCATION & DAMAGE

ENCLOSURE (B) TO D.S.M. SERIAL 001800

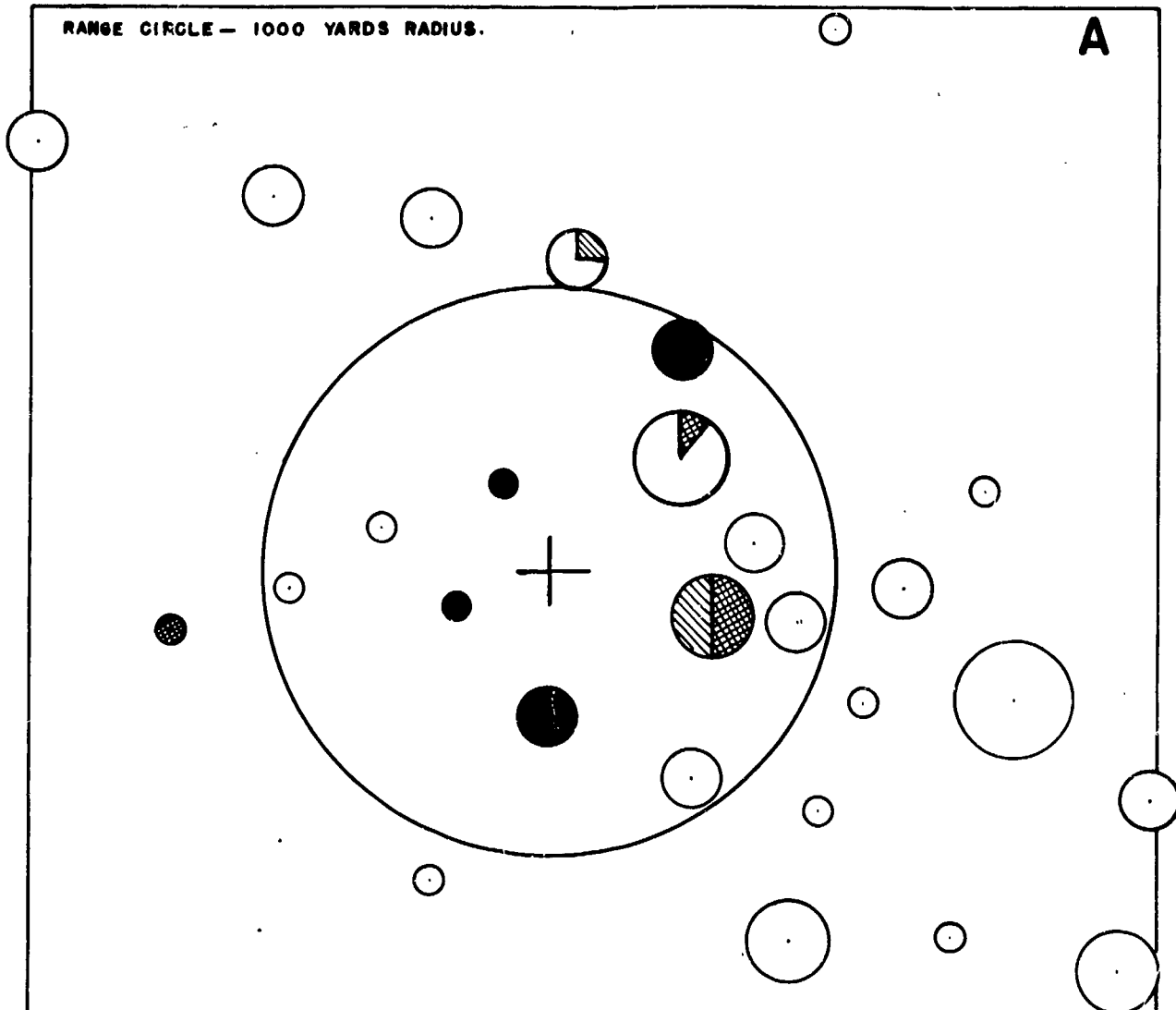
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SECRET

RANGE CIRCLE - 1000 YARDS RADIUS.

A



KEY

SUNK

1 GUN BATTERY

LIGHT OR
NO DAMAGE(%)

PERCENT NOT OPERABLE

4 GUN BATTERY

DAMAGED BUT OPERABLE(%)

3" & 5" GUNS

TEST "A" INTERMEDIATE CALIBER MOUNTS-LOCATION, QUANTITY & DAMAGE

ENCLOSURE (D) TO D.S.M. SERIAL 001500

VOL. I

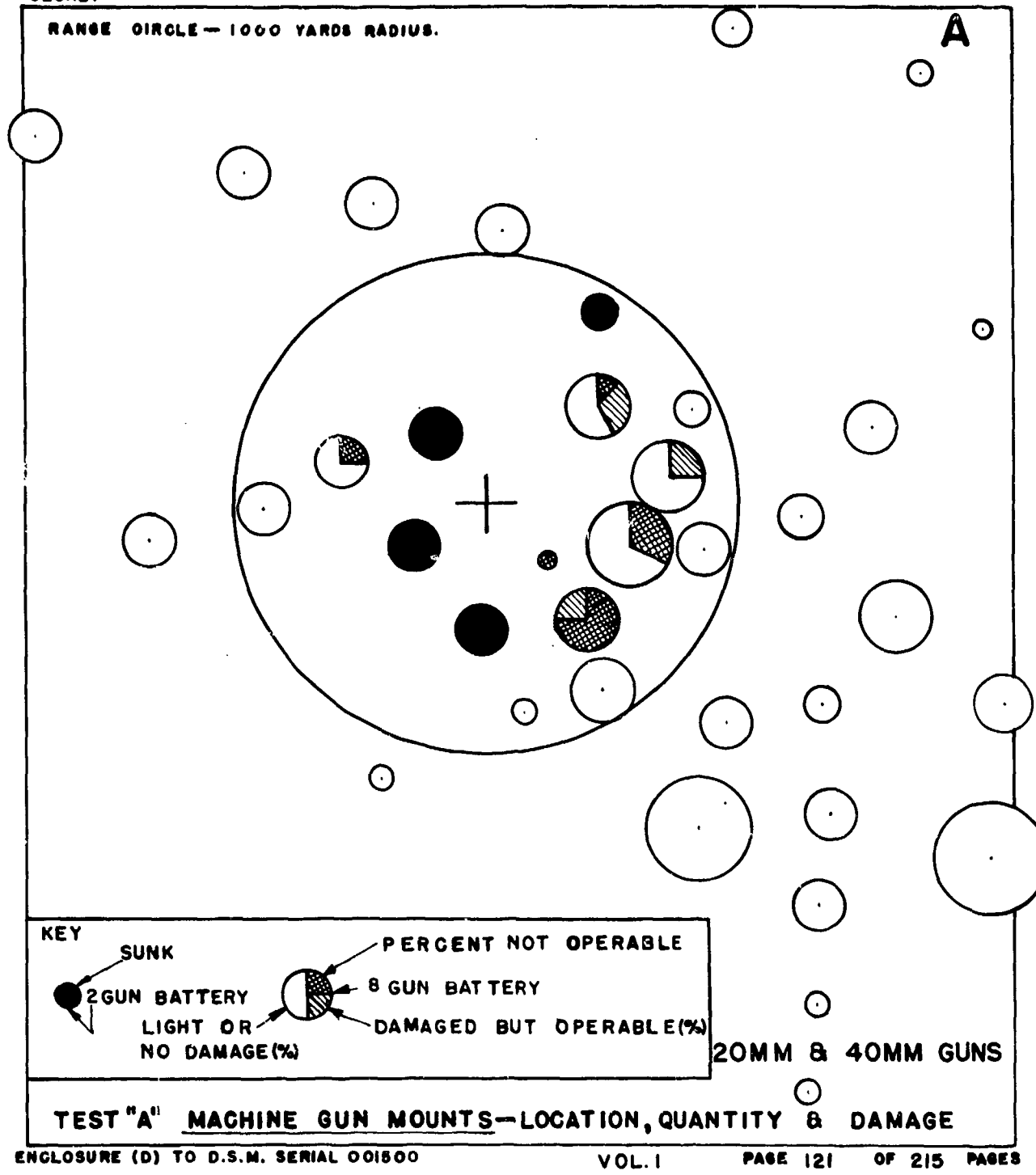
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SECRET

RANGE CIRCLE — 1000 YARDS RADIUS.

A



S E C R E T

TEST "B"

LARGE CALIBER GUNS

<u>Type of Turret</u>	<u>No. of Turrets</u>	<u>Ship</u>	<u>Approximate Yards</u>
12"/50 Two Gun	6	ARKANSAS BB	300
14"/45 Two Gun	2	NEVADA BB	1000
14"/45 Triple Gun	2	NEVADA BB	1000
14"/45 Two Gun	5	NEW YORK BB	1200
14"/45 Triple	4	PENNSYLVANIA BB	1400
8"/55 Triple Mount	2	PENSACOLA CA	700
8"/55 Twin Mount	2	PENSACOLA CA	700
8"/55 Triple Mount	2	SALT L. CITY CA	1200
8"/55 Twin Mount	2	SALT L. CITY CA	1200
20.3 CM Two Gun Turret	4	PRINZ EUGEN' CA	1700

INTERMEDIATE CALIBER GUNS

<u>Type Of Mount</u>	<u>No. of Mounts</u>	<u>Ship</u>	<u>Approximate Yards</u>
5"/38 Single - Open	1	FALLOK APA	500
5"/38 Single - Closed	3	HUGHES DD	700
5"/38 Single - Open	1	HUGHES DD	700
5"/38 Single - Closed	3	MAYRANT DD	750
5"/38 Single - Open	1	MAYRANT DD	800
5"/38 Twin - Closed	4	NEVADA BB	1000
5"/38 Single - Closed	3	TRIPPE DD	1100
5"/38 Single - Open	1	TRIPPE DD	1100
5"/38 Single - Open	1	DAWSON APA	1300
5"/38 Single - Closed	3	MUSTIN DD	1300
5"/38 Single - Open	1	MUSTIN DD	1300
5"/38 Twin - Closed	4	PENNSYLVANIA BB	1400
5"/38 Single - Closed	2	WILSON DD	1400
5"/38 Single - Open	2	WILSON DD	1400
5"/38 Single - Open	1	CATRON APA	1400
5"/38 Single - Open	1	CRITTENDEN APA	1500
5"/38 Single - Open	1	BRACKEN APA	1800
5"/38 Single - Closed	2	R. TALBOT DD	1800
5"/38 Single - Open	2	R. TALBOT DD	1800
5"/38 Single - Closed	2	STACK DD	1800
5"/38 Single - Open	2	STACK DD	1800
5"/38 Single - Open	1	BARROW APA	1900
5"/38 Single - Closed	4	RHIND DD	2200
5"/38 Single - Open	1	BANNER APA	2300

S E C R E T

Enclosure (D) to Director Ship Material Serial 001500

S E C R E T

TEST "B" (Continued)

INTERMEDIATE CALIBER GUNS (Continued)

<u>Type of Mount</u>	<u>No. of Mounts</u>	<u>Ship</u>	<u>Approximate Yards</u>
5"/38 Single - Closed	3	MUGFORD DD	2500
5"/38 Single - Open	1	MUGFORD DD	2500
5"/38 Single - Closed	3	WAINWRIGHT DD	2900
5"/38 Single - Open	1	WAINWRIGHT DD	2900
5"/38 Single - Open	1	CARTERET APA	3000
5"/38 Single - Open	1	NIAGARA APA	3200
5"/38 Single - Open	4	CONYNGHAM DD	3400
5"/38 Single - Open	1	CORTLAND APA	3600
5"/51 Single - Open	1	TUNA SS	1800
5"/51 Single - Air Castle	6	NEW YORK BB	1200
5"/25 Single - Open	4	PENSACOLA CA	700
5"/25 Single - Open	4	SALT L. CITY CA	1200
5"/25 Single - Open	1	PARCHE SS	1400
10.5 CM Twin - Open	4	PRINZ EUGEN CA	1700
3"/50 Single - Open	10	NEW YORK BB	1200

LIGHT CALIBER GUNS

40 MM Quad	2	PENSACOLA CA	700
40 MM Quad	1	SALT L. CITY CA	1200
40 MM Quad	4	PENNSYLVANIA BB	1400
40 MM Twin	2	FALLON APA	500
40 MM Twin	2	HUGHES DD	700
40 MM Twin	2	MAYRANT DD	750
40 MM Twin	2	GASCONADE APA	750
40 MM Twin	2	NEVADA BB	1000
40 MM Twin	2	TRIPPE DD	1100
40 MM Twin	2	NEW YORK BB	1200
40 MM Twin	2	DAWSON APA	1300
40 MM Twin	2	MUSTIN DD	1300
40 MM Twin	1	PENNSYLVANIA BB	1400
40 MM Twin	3	INDEPENDENCE CVL	1400
40 MM Twin	2	WILSON DD	1400
40 MM Twin	2	CATRON APA	1400
40 MM Twin	2	CRITTENDEN APA	1500
40 MM Twin	2	BRACKEN APA	1800
40 MM Twin	1	R. TALBOT DD	1800
40 MM Twin	2	STACK DD	1800
40 MM Twin	2	BARROW APA	1900
40 MM Twin	2	RHIND DD	2200

S E C R E T

Enclosure (D) to Director Ship Material Serial 001500.

S E C R E T

TEST "B" (Continued)

LIGHT CALIBER GUNS (Continued)

<u>Type of Mount</u>	<u>No. of Mounts</u>	<u>Ship</u>	<u>Approximate Yards</u>
40 MM Twin	2	BANNER APA	2300
40 MM Twin	1	MUGFORD DD	2500
40 MM Twin	2	WAINWRIGHT DD	2900
40 MM Twin	2	CARTERET APA	3000
40 MM Twin	2	NILGARA APA	3200
40 MM Twin	2	CONYNGHAM LD	3400
40 MM Twin	2	CORTLAND APA	3600
40 MM Single	1	DENTUDA SS	1200
40 MM Single	2	PARCHE SS	1400
40 MM Single	5	PRINZ EUGEN CA	1700
20 MM Quad	5	PRINZ EUGEN CA	1700
20 MM Twin	4	PENSACOLA CA	700
20 MM Twin	8	NEVADA BB	1000
20 MM Twin	6	NEW YORK BB	1200
20 MM Twin	8	PENNSYLVANIA BB	1400
20 MM Twin	2	TUVA SS	1800
20 MM Single	4	FALLON APA	500
20 MM Single	4	HUGHES DD	700
20 MM Single	4	MAYRANT DD	300
20 MM Single	4	GASCONADE APA	900
20 MM Single	4	BRUIE APA	800
20 MM Single	4	TRIPPE DD	1100
20 MM Single	4	BRISCOE APA	1200
20 MM Single	8	SALT L. CITY CA	1200
20 MM Single	4	DAWSON APA	1300
20 MM Single	3	MUSTIN DD	1300
20 MM Single	2	INDEPENDENCE CVL	1400
20 MM Single	4	WILSON DD	1400
20 MM Single	4	CALHON APA	1400
20 MM Single	4	CRITTENDEN APA	1500
20 MM Single	4	BRACKEN APA	1800
20 MM Single	4	R. TALBOT DD	1800
20 MM Single	4	STACK DD	1800
20 MM Single	4	BARROW APA	1900
20 MM Single	2	FILLMORE APA	2100
20 MM Single	4	RHIND DD	2200
20 MM Single	4	BANNER APA	2300
20 MM Single	2	BLADEN APA	2500

S E C R E T

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S E C R E T

TEST "B" (Continued)

LIGHT CALIBER GUNS (Continued)

<u>Type of Mount</u>	<u>No. of Mounts</u>	<u>Ship</u>	<u>Approximate Yards</u>
20 MM Single	4	MUGFORD DD	2500
20 MM Single	2	BUTTE APA	2700
20 MM Single	2	GENEVA APA	2800
20 MM Single	4	WAINWRIGHT APA	2900
20 MM Single	4	CARTERET APA	3000
20 MM Single	4	NIAGARA APA	3200
20 MM Single	4	CONYNGHAM DD	3400
20 MM Single	2	CORTLAND APA	3600
.50 Cal. Quad (Maxon)	1	PENNSYLVANIA AS	1400
.50 Cal. Quad (Maxon)	2	PARCHE SS	1400
.50 Cal. Quad (Maxon)	2	TUNA SS	1800

S E C R E T

Enclosure (D) to Director Ship Material Serial 001500.

S E C R E T

DAMAGE TO INTERMEDIATE CALIBER GUNS

U.S.S. FALLON (APA-81) - Approximately 500 yards from Center of Detonation.
Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "B".

U.S.S. HUGHES (DD-410) - Approximately 700 yards from Center of Detonation.
Armament: Four 5"/38 Single Mounts.

As a result of Test "B" the 5"/38 mounts were severely damaged by shock.

Mount #1 - The trunnion bearing block holding down bolts were elongated, loose, and readily removable by hand. Photographs ABCR 76-1931-8, 9 show this condition quite clearly. The rammer cover plate and hydraulic equipment and all counter weights were loose. There is an excessive amount of clearance between the holding down clips and the training circle. The center column pivot castings shows evidence of vertical shock. It is believed this was caused by movement of the deck and gun foundations.

Mount #2 - The trunnion bearing block holding down bolts were elongated, loose, and readily removable by hand. All counter weights were loose.

Mount #3 - The trunnion bearing block holding down bolts were elongated, loose and readily removable by hand. The rammer cover plate and hydraulic equipment and counter weights were loose. The rear rammer counterweight was separated from the mount due to the shearing off of the four securing bolts. There are indications of separation from the base ring weldment around the feet of the carriage.

Mount #4 - All counterweights were loose but no other damage from shock was apparent.

U.S.S. PENSACOLA (CA-24) - Approximately 700 yards from Center of Detonation.
Armament: Four 5"/25 Single Mounts.

There was no damage to this equipment as a result of Test "B". The mounts were conditioned as follows:

<u>MOUNT</u>	<u>ELEVATION</u>	<u>TRAIN</u>
5	0 Deg.	160 Deg.
6	Minus 5.	0 Deg.
7	85 Deg.	180 Deg.
8	75 Deg.	185 Deg.

U.S.S. MAYRANT (DD-402) - Approximately 800 yards from Center of Detonation.
Armament: Four 5"/38 Single Mounts.

There was no damage to this equipment as a result of Test "B".

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DAMAGE TO INTERMEDIATE CALIBER GUNS (Continued)

U.S.S. NEVADA (BB-36) - Approximately 1000 yards from Center of Detonation.
Armament: Four 5"/38 Twin Mounts.

There was no damage to this equipment as a result of Test "B".

U.S.S. TRIPPE (DD-403) - Approximately 1100 yards from Center of Detonation.
Armament: Four 5"/38 Single Mounts.

There was no damage to this equipment as a result of Test "B".

U.S.S. NEW YORK (BB-34) - Approximately 1200 yards from Center of Detonation.
Armament: Six 5"/51 Single Mounts.

5"/51 Mounts (located in port and starboard Air-castles).

There was no change in this equipment as a result of Test "B".

The Mounts were conditioned as follows:

<u>MOUNT</u>	<u>BREECH</u>	<u>ELEVATION</u>	<u>TRAIN</u>
1	Open	Minus 3	Normal Stowage.
2	Closed	5 Deg.	Normal Stowage.
3	Open	0 Deg.	Normal Stowage.
4	Closed	0 Deg.	Normal Stowage.
5	Closed	Maximum	Normal Stowage.
6	Open	Maximum	Normal Stowage.

U.S.S. SALT LAKE CITY (CA-25) - Approximately 1200 yards from Center of Detonation.
Armament: Four 5"/25 Single Mounts.

There was no damage to this equipment as a result of Test "B".

The mounts were conditioned as follows:

<u>MOUNT</u>	<u>CONDITION</u>	<u>ELEVATION</u>	<u>TRAIN</u>
1	Zebra	5 Deg.	0 Deg.
2	Yoke	5 Deg.	0 Deg.
3	Zebra	5 Deg.	180 Deg.
4	Yoke	5 Deg.	180 Deg.

U.S.S. DAWSON (APA-79) - Approximately 1300 yards from Center of Detonation.
Armament: One 5"/38 Single Mounts.

There was no damage to this equipment as a result of Test "B".

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DAMAGE TO INTERMEDIATE CALIBER GUNS (Continued)

U.S.S. MUSTIN (DD-413) - Approximately 1300 yards from Center of Detonation.
Armament: Four 5"/38 Single Mounts.

There was no damage to this equipment as a result of Test "B".

U.S.S. PENNSYLVANIA (BB-38) - Approximately 1400 yards from Center of Detonation.
Armament: Four 5"/38 Twin Mounts.

There was no damage to this equipment as a result of Test "B".

U.S.S. WILSON (DD-408) - Approximately 1400 yards from Center of Detonation.
Armament: Four 5"/38 Single Mounts.

There was no damage to this equipment as a result of Test "B".

U.S.S. PARCHÉ (SS-384) - Approximately 1400 yards from Center of Detonation.
Armament: One 5"/25 Single Mount.

There was no damage to this equipment as a result of Test "B".

U.S.S. CATRON (APA-71) - Approximately 1400 yards from Center of Detonation.
Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "B".

U.S.S. CRITTENDEN (APA-77) - Approximately 1500 yards from Center of Detonation.
Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "B".

U.S.S. PRINZ EUGEN (CA-Ger) - Approximately 1700 yards from center of Detonation.
Armament: Four 10.5 CM Twin Mounts.

There was no damage to this equipment as a result of Test "B".

U.S.S. TUNA (SS-203) - Approximately 1800 yards from Center of Detonation.
Armament: One 5"/51 Single Mount.

There was no damage to this equipment as a result of Test "B".

U.S.S. BRACKEN (APA-64) - Approximately 1800 yards from Center of Detonation.
Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "B".

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DAMAGE TO INTERMEDIATE CALIBER GUNS (Continued)

U.S.S. RALPH TALBOT (DD-390) - Approximately 1800 yards from Center of Detonation.
Armament: Four 5"/38 Single Mounts.

There was no damage to this equipment as a result of Test "B".

U.S.S. STACK (DD-406) - Approximately 1800 yards from Center of Detonation.
Armament: Four 5"/38 Single Mounts.

There was no damage to this equipment as a result of Test "B".

U.S.S. FARROW (APA-61) - Approximately 1900 yards from Center of Detonation.
Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "B".

U.S.S. RHIND (DD-404) - Approximately 2200 yards from Center of Detonation.
Armament: Four 5"/38 Single Mounts.

There was no damage to this equipment as a result of Test "B".

U.S.S. BANNER (APA-60) - Approximately 2300 yards from Center of Detonation.
Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "B".

U.S.S. MUGFORD (DD-389) - Approximately 2500 yards from Center of Detonation.
Armament: Four 5"/38 Single Mounts.

There was no damage to this equipment as a result of Test "B".

U.S.S. WAINWRIGHT (DD-419) - Approximately 2900 yards from Center of Detonation.
Armament: Four 5"/38 Single Mounts.

There was no damage to this equipment as a result of Test "B".

U.S.S. CARTERET (APA-70) - Approximately 3000 yards from Center of Detonation.
Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "B".

U.S.S. NIAGARA (APA-87) - Approximately 3200 yards from Center of Detonation.
Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "B".

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DAMAGE TO INTERMEDIATE CALIBER GUNS (Continued)

U.S.S. CONYNGHAM (DD-371) - Approximately 3400 yards from Center of Detonation.
Armament: Four 5"/38 Single Mounts.

There was no damage to this equipment as a result of Test "B".

U.S.S. CORTLAND (APA-75) - Approximately 3600 yards from Center of Detonation.
Armament: One 5"/38 Single Mount.

There was no damage to this equipment as a result of Test "B".

U.S.S. NEW YORK (BB-34) - Approximately 1200 yards from Center of Detonation.
Armament: 10 3"/50 Single Mounts.

There was no change in this equipment as a result of Test "B".

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DAMAGE TO LARGE CALIBER GUNS

U.S.S. ARKANSAS (BB-34) - Approximately 300 yards from Center of Detonation.
Armament: Six 12"/50 Two Gun Turrets.
Inspection of the equipment was not possible as the vessel was sunk as a result of Test "B".

U.S.S. NEVADA (BB-36) - Approximately 1000 yards from Center of Detonation.
Armament: Two 14"/45 Triple Gun Turrets.
Two 14"/45 Two Gun Turrets.

Turrets 1, 2, 3 and 4.

There was no damage to this equipment which would impair normal operation. The securing bolts of the holding down clip located at the after center-line of turret #2 have been sheared off as a result of the upward thrust of the explosion. It is to be noted that the holding down clip was not distorted or damaged but dropped off due to the shearing of the bolts.

<u>TURRETS</u>	<u>CONDITION</u>	<u>ELEVATION</u>	<u>TRAIN</u>
1	Zebra	0 Degrees	0 Degrees
2	Yoke	0 Degrees	0 Degrees
3	Zebra	0 Degrees	180 Degrees
4	Yoke	0 Degrees	180 Degrees

U.S.S. NEW YORK (BB-34) - Approximately 1200 yards from Center of Detonation.
Armament: Five 14"/45 Two Gun Turrets.

Turrets 1, 2, 3, 4 and 5.

Turret #1 - There was no damage to this equipment as a result of Test "B".
Turret #2 - The damage to this equipment consisted of the failure of the left gun elevating nut and oscillating bearings. It is believed that the shock caused the gun to oscillate violently in a vertical plane. This oscillation caused the lower ball bearing roller race and adjusting nut to be sheared off, thus permitting the ball bearings to fall free. This damage immobilizes the left gun. The right gun of this turret is in a completely operable condition.

Turret #3 - The damage to this equipment was identical with that of turret #2 except that it occurred to the right gun instead of the left gun.

NOTE: Normal stowage of turret #3 is 180 degrees.

Turret #4 - The damage to this equipment was identical with that of turret #3 except that the lower portion of the after port side holding down clip of turret #4 was partly carried away also. It is estimated that 60% of the clip remains intact. The portion of the clip that carried away fell upon the positive stop but did not interfere with the training of the turret.

Turret #5 - There was no damage to this equipment as a result of Test "B" except that the lower portion of the two port side holding down clips of Turret #5 have definite cracks in them.

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DAMAGE TO LARGE CALIBER GUNS (Continued)

U.S.S. NEW YORK (BB-34) - Turret #5 - (Continued)

This damage was not serious and should not interfere with the training operation of the turret. In considering this damage as a result of Test "B" attention is invited to the fact that these guns were not in a state of readiness for firing. The turrets of this vessel were undergoing a Naval Shipyard overhaul at the end of World War II and due to the cessation of hostilities the work was not completed. The guns were not set-up on the knife edges thus causing the guns to be muzzle heavy. It is believed that this muzzle heaviness which creates an unbalanced condition, accentuated the effects of the heavy shock and caused greater damage than would normally have been the case. There was no damage to the right gun elevating nut and oscillating bearing in turret #5 and this was probably due to the fact that the gun was elevated to its maximum thus reducing the turning moment of the installation under shock impulse. From the above it is interesting to note that the major damage to heavy equipment was confined to the port side, or that side nearest the Center of Detonation.

Photographs ABCR 82-4222-6, 7, 8, 9, 10 clearly show the damage to the elevating screw and oscillating nut of turret #2.

Photographs ABCR 68-2981-1, 2 clearly show the damage to the elevating screws and oscillating nut of turret #3.

Photographs ABCR 4223-1 show the damage to the oscillating nut of turret #4.

Photographs ABCR 234-2207-1, 2, 4, 5, 6, 7 and 8 shows the damage to the holding down clip of turret #5.

The turrets were conditioned as follows:

<u>TURRET</u>	<u>CONDITION</u>	<u>ELEVATION</u>	<u>TRAIN</u>
1	Zebra	Loading Position	0 Deg.
2	Yoke	Loading Position	0 Deg.
3	Zebra	Loading Position	180 Deg.
4	Yoke	Loading position	180 Deg.
5	Zebra	Maximum Elevation	180 Deg.

U.S.S. PENNSYLVANIA (BB-38) - Approximately 1400 yards from Center of Detonation.
Armament: Four 14"/45 Triple Gun Turrets.

There was no damage to this equipment as a result of Test "B".

The Turrets were conditioned as follows:

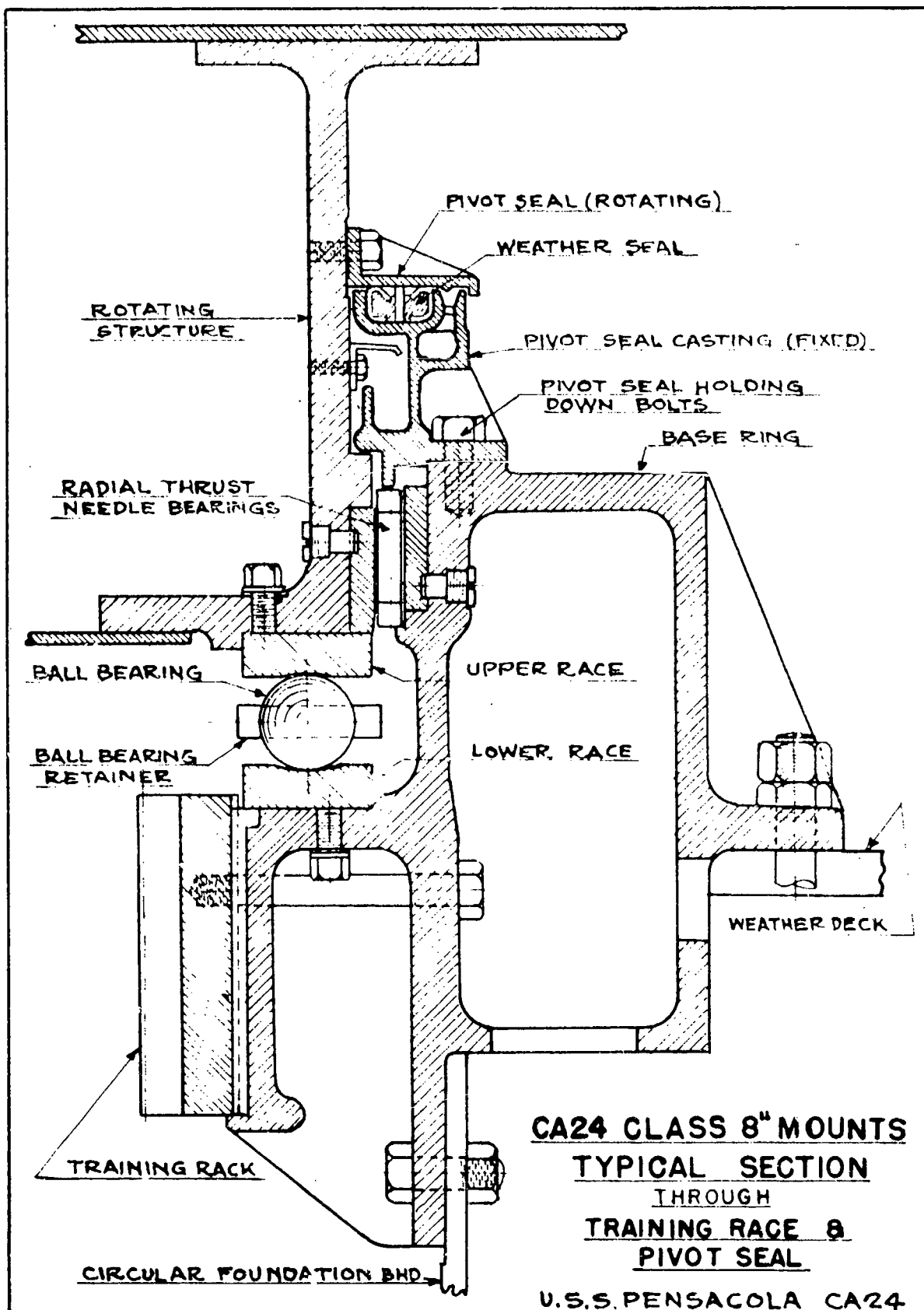
<u>TURRET</u>	<u>CONDITION</u>	<u>ELEVATION</u>	<u>TRAIN</u>	<u>BREECH</u>
1	Zebra	Normal Stowage	0 Deg.	R.G. Open
2	Yoke	Normal Stowage	0 Deg.	L.G. Open
3	Zebra	20 Deg.	270 Deg.	Closed.
4	Yoke	Normal Stowage.	180 Deg.	L.G. Open.

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DAMAGE TO LARGE CALIBER GUNS (Continued)

U.S.S. PENNSYLVANIA (BB-38) (Continued)

Some evidence of shock was found in that the holding down clips left imprints in the grease on the underside of the roller path indicating that an upward motion of the turret occurred.

U.S.S. PENSACOLA (CA-24) - Approximately 700 yards from Center of Detonation.

Armament:

- (a) Two 8"/55 Triple Mounts.
- (b) Two 8"/55 Twin Mounts.
- (c) Four 5"/25 Single Mounts.
- (d) Two 40 MM Quad Mounts.
- (e) Four 20 MM Twin Mounts.

8"/55 Mounts 1, 2, 3 and 4.

Mount #1 - This mount was severely damaged as a result of Test "B". The weather seal which is located at the base of the mount was torn loose by the upward thrust of the mount under shock impulse. The majority of the weather seal securing bolt-heads were sheared off. Those bolts that did not shear tore through the seal. This mount evidently returned to a nearly normal position after its upward movement. The after bulkhead of the left powder hoist trunk was also ruptured by this upward movement of the mount. The trunnion cap square bolts of the oscillating nut housing were sheared off, thus permitting the casing to pull up and thereby disengaging the shaft coupling which joins the oscillating nut and the hydraulic motor. The hinge pin of the left gun breech was bent in such a manner as to prevent the engagement of the interrupted thread of the breech plug. The safety links which were engaged prior to Test "B" were found to be sheared off; this shearing action could be caused only by the recoiling of the guns. The amount of recoil was impossible to determine because the grease had been removed from the slide cylinder by Ship's force prior to the inspection. Three sections (port forward, forward centerline and after centerline) of the ball bearings and spacers moved inboard toward the center of rotation. This movement caused the spacer sections to be distorted, but the distortion was not sufficient to dislodge the balls or permit them to fall free. The training pinion gear was jammed against the training rack by the movement of the mount. This condition is the exact opposite to that of mount #2 as the training pinion in that mount moved away from the training rack.

Photographs ABCR 97-1685-11, 12 - ABCR 97-1686-1 show the damage to the weather seal. Photograph 1685-12 is a view taken at the after centerline. 1685-12 is a view of the starboard side. 1686-1 is a view of the port side.

Photograph ABCR 97-1686-2, 3 shows the damage to the elevation nut housing and the Oldham coupling.

Photograph ABCR 97-1686-5, shows the ruptured bulkhead of the upper powder transfer room.

Photograph ABCR 97-1686-6 shows the bent hinge pin of the left breech plug.

Photograph ABCR 97-1686-7, 8, 9, 10, 11 and 12 shows the damage to the rack, pinion and the roller bearing.

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U.S.S. PENSACOLA (CA-24) (Continued)

MOUNT #2

This mount was severely damaged as a result of Test "B". The weather seal which is located at the base of the mount was torn loose by upward thrust of the mount under shock impulse. The majority of the weather seal securing bolts heads were sheared off and those bolts that held tore through the seal. The after portion of the seal suffered the greatest damage, while the forward portion was only distorted. The mount was found to be raised 5 1/2 " from its normal position at the after centerline, to a minimum forward, which was immeasurable in the Bikini area. This upward thrust of 5 1/2 " permitted the centerline section of the 4" thrust needle bearings to fall free of its secured position. The adjacent sections of the thrust needle bearing, although loosened from their secured positions, did not fall free but were caught and pinned in a vertical position. It is believed that there were at least two upward movements of the mount. This is evidenced by the imprint of the needle bearing of the centerline section upon the foundation of the weather seal. It is believed that the first upward movement was of such a degree as to permit the adjacent sections to become loose from their secured positions but not to an extent that would cause them to fall free. As the mount moved downward again it pinned the needle bearing against the weather seal ring in a vertical position. The ball bearings and the bearing spacers which take the vertical weight of the mount were severely damaged. The upward thrust of the mount permitted some of the ball bearings to fall free and become scattered about the powder transfer room. Although some of the ball bearings fell free, a greater number of them rolled forward and were caught beneath the spacers. The ball bearing spacers also moved toward the center of rotation; this is evidenced by the overlapping of the spacers. This overlapping is from 3" to 5" in some cases and is as great as 18" at the after centerline. As the mount moved, two of the ball bearings rolled inboard and lodged between the training rack and the training pinion gear. The pinion gear moved aft and away from the training rack to such a distance as to permit a measurement reading of 3/16". This reading was taken at the addendum of the rack and pinion gear. The lower cover plate of the training pinion housing fell clear of its secured positions. This was caused by the shearing of the securing bolts. The right upper powder hoist is completely inoperable because the shifting of the mount crushed the trunk and jammed the hoist.

Photograph ABCR 97-1684-2,3,4,5,6,7,8,9,10 and 11 shows the exposed horizontal thrust bearings and the ruptured weather seal.

Photograph ABCR 97-1685-1,2,3,4,5,6,7,8, and 9 shows the damage to the rack, pinion and the roller bearings. 1685-10 shows the crushed powder hoist.

Photograph ABCR 1677-12, 1678-1 of the Explosives Group shows the distortion of the deck structure at the shell deck level. A distance of approximately 6" was measured between the rotating structure and the fixed structure.

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U.S.S. PENSACOLA (CA-24) (Continued)

MOUNT #3

This mount was not severely damaged as a result of Test "B". The weather seal of this mount was torn at the after centerline and also at the port and starboard sides. A great many of the bolt heads were sheared off. There is no evidence to prove that the mount did not reseal itself; although it is evident that the mount moved approximately 3/4" toward the starboard side. This mount has the conical type roller bearing with a bronze retaining ring. Upon inspection it was found that the roller bearing unit had shifted approximately 3/4" toward the starboard side. The safety links which were engaged prior to Test "B" were found to be sheared off. This shearing action could only be caused by the recoiling of the guns. The training pinion gear was jammed against the training rack by the movement of the mount. The after centerline section of the training rack moved upward 1/4" at the butted joint. There is no other evidence of the training rack having been displaced. The shutter on the left mount ear was blasted inward and wrapped over the left end-window of the Rangefinder. This damage rendered the shutter inoperative.

Photograph ABCR 97-1687-7 shows the broken safety links of the right and center gun.

MOUNT #4

This mount was not severely damaged as a result of Test "B". The weather seal of this mount was torn loose on the starboard side. A great many of the bolt heads in this section were sheared off. Two sections of the ball bearings and spacers (starboard quarter and starboard centerline) moved inboard toward the center of rotation. In doing this the spacer sections were distorted, but this distortion was not sufficient to dislodge the balls nor permit them to fall free. The threads of the two securing bolts nearest the barbette on the lower cover plate of the training pinion housing were stripped. It is believed that this action was caused by the movement of the mount. The hinge-pin of the right gun breech was bent in such a manner as to prevent the engaging of the interrupted thread of the breech plug.

Photograph ABCR 97-1687-8 shows the damage to the lower training pinion housing. Photograph ABCR 97-1687-9 shows a section of the roller bearing exposed. This picture was taken at starboard aft.

U.S.S. SALT LAKE CITY (CA-25) - Approximately 1200 yards from Center of Detonation.

Armament: Two 8"/55 Triple Gun Mounts.
 Two 8"/55 Twin Gun Mounts.

There was no damage to this equipment as a result of Test "B".

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U.S.S. SALT LAKE CITY (CA-25) (Continued)

The mounts were conditioned as follows:

<u>MOUNT</u>	<u>CONDITION</u>	<u>ELEVATION</u>	<u>TRAIN</u>
1	Zebra	5 Degrees	0 Degrees
2	Yoke	5 Degrees	0 Degrees
3	Zebra	5 Degrees	180 Degrees
4	Yoke	5 Degrees	180 Degrees

U.S.S. PRINZ EUGEN (CA-Ger) - Approximately 1700 yards from Center of Detonation.
Armament: Four 20.3 CM Two Gun Turrets.

There was no damage to this equipment as a result of Test "B".

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DAMAGE TO LIGHT CALIBER GUNS

U.S.S. FALLON (APA-81) - Approximately 500 yards from Center of Detonation.
Armament: Two 40 MM Twin Mounts.
Four 20 MM Single Mounts.

There was no damage to this equipment as a result of Test "B".

U.S.S. PENSACOLA (CA-24) - Approximately 700 yards from Center of Detonation.
Armament: Two 40MM Quad Mounts.
Four 20MM Twin Mounts.

There was no change to this equipment as a result of Test "B".

U.S.S. HUGHES (DD-410) - Approximately 700 yards from Center of Detonation.
Armament: Two 40MM Twin Mounts.
Four 20MM Single Mounts.

There was no change to this equipment as a result of Test "B".

U.S.S. MAYRANT (DD-402) - Approximately 800 yards from Center of Detonation.
Armament: Two 40MM Twin Mounts.
Four 20MM Single Mounts.

There was no change to this equipment as a result of Test "B".

U.S.S. GASCONADE (APA-85) - Approximately 800 yards from Center of Detonation.
Armament: Two 40MM Twin Mounts.
Four 20MM Single Mounts.

There was no change to this equipment as a result of Test "B".

U.S.S. BRULE (APA-66) - Approximately 800 yards from Center of Detonation.
Armament: Four 20MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. NEVADA (BB-36) - Approximately 1000 yards from Center of Detonation.
Armament: Two 40MM Twin Mounts.
Eight 20MM Twin Mounts.

There was no damage to this equipment as a result of Test "B".

U.S.S. TRIPPE (DD-403) - Approximately 1100 yards from Center of Detonation.
Armament: Two 40MM Twin Mounts.
Four 20MM Single Mounts.

There was no change in this equipment as a result of Test "B".

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DAMAGE TO LIGHT CALIBER GUNS (Continued)

U.S.S. BRISCOE (APA-65) - Approximately 1100 yards from Center of Detonation.
Armament: Four 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. NEW YORK (BB-34) - Approximately 1200 yards from Center of Detonation.
Armament: Two 40 MM Twin Mounts.
Six 20 MM Twin Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. SALT LAKE CITY (CA-25) - Approximately 1200 yards from Center of Detonation.
Armament: One 40 MM Quad Mount.
Eight 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. DENTUDA (SS-335) - Approximately 1200 yards from Center of Detonation.
Armament: Two 40 MM Twin Mounts.
Four 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. DAWSON (APA-79) - Approximately 1300 yards from Center of Detonation.
Armament: Two 40 MM Twin Mounts.
Four 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. MUSTIN (DD-413) - Approximately 1300 yards from Center of Detonation.
Armament: Two 40 MM Twin Mounts.
Three 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. PENNSYLVANIA (BB-38) - Approximately 1400 yards from Center of Detonation.
Armament: Four 40MM Quad Mounts.
One 40MM Twin Mount.
Eight 20MM Twin Mounts.
One .50 Caliber Quad (Maxon)

There was no change in this equipment as a result of Test "B".

U.S.S. INDEPENDENCE (CVL-22) - Approximately 1400 yards from Center of Detonation.
Armament: Three 40 MM Twin Mounts.
Two 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

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DAMAGE TO LIGHT CALIBER GUNS (Continued)

U.S.S. WILSON (DD-408) - Approximately 1400 yards from Center of Detonation.
Armament: Two 40 MM Twin Mounts.
Four 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. PARCHE (SS-384) - Approximately 1400 yards from Center of Detonation.
Armament: Two 40 MM Single Mounts.
Two .50 Caliber Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. CATRON (APA-71) - Approximately 1400 yards from Center of Detonation.
Armament: Two 40 MM Twin Mounts.
Four 20 MM Single Mounts.

U.S.S. CRITTENDEN (APA-77) - Approximately 1500 yards from Center of Detonation.
Armament: Two 40 MM Twin Mounts.
Four 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. PRINZ EUGEN (CA-Ger) - Approximately 1700 yards from Center of Detonation.
Armament: Five 40 MM Single Mounts.
Five 20 MM Quad Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. TUNA (SS-203) - Approximately 1800 yards from center of Detonation.
Armament: Two 20 MM Twin Mounts.
Two .50 Caliber Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. BRACKEN (APA-64) - Approximately 1800 yards from Center of Detonation
Armament: Two 40 MM Twin Mounts.
Four 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. RALPH TALBOT (DD-390) - Approximately 1800 yards from Center of Detonation.
Armament: One 40 MM Twin Mount.
Four 20 MM Single Mounts.

There was no change in this equipment as a result of Test "I".

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DAMAGE TO LIGHT CALIBER GUNS (Continued)

U.S.S. STACK (DD-406) - Approximately 1800 yards from Center of Detonation.
Armament: Two 40 MM Twin Mounts.
Four 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. BARROW (APA-61) - Approximately 1900 yards from Center of Detonation.
Armament: Two 40 MM Twin Mounts.
Four 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. WILLMORE (APA-83) - Approximately 2200 yards from Center of Detonation.
Armament: Two 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. RHIND (DD-404) - Approximately 2200 yards from Center of Detonation.
Armament: Two 40 MM Twin Mounts.
Four 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. BANNER (APA-60) - Approximately 2300 yards from Center of Detonation.
Armament: Two 40 MM Twin Mounts
Four 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. BLADEN (APA-63) - Approximately 2500 yards from Center of Detonation.
Armament: Two 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. MUGFORD (DD-389) - Approximately 2500 yards from Center of Detonation.
Armament: One 40 MM Twin Mount.
Four 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. BUTTE (APA-68) - Approximately 2700 yards from Center of Detonation.
Armament: Two 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

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DAMAGE TO LIGHT CALIBER GUNS (Continued)

U.S.S. GENEVA (APA-86) - Approximately 2800 yards from Center of Detonation.
Armament: Two 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. WAINWRIGHT (DD-419) - Approximately 2900 yards from Center of Detonation.
Armament: Two 40 MM Twin Mounts.
Four 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. CARTERET (APA-70) - Approximately 3000 yards from Center of Detonation.
Armament: Two 40 MM Twin Mounts.
Four 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. NIAGARA (APA-87) - Approximately 3200 yards from Center of Detonation.
Armament: Two 40 MM Twin Mounts.
Four 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. CONYNGHAM (DD-371) - Approximately 3400 yards from Center of Detonation.
Armament: Two 40 MM Twin Mounts.
Four 20 MM Single Mounts.

There was no change in this equipment as a result of Test "B".

U.S.S. CORTLAND (APA-75) - Approximately 3600 yards from Center of Detonation.
Armament: Two 40 MM Twin Mounts.
Two 20 MM Single Mounts.

There was no damage to this equipment as a result of Test "B".

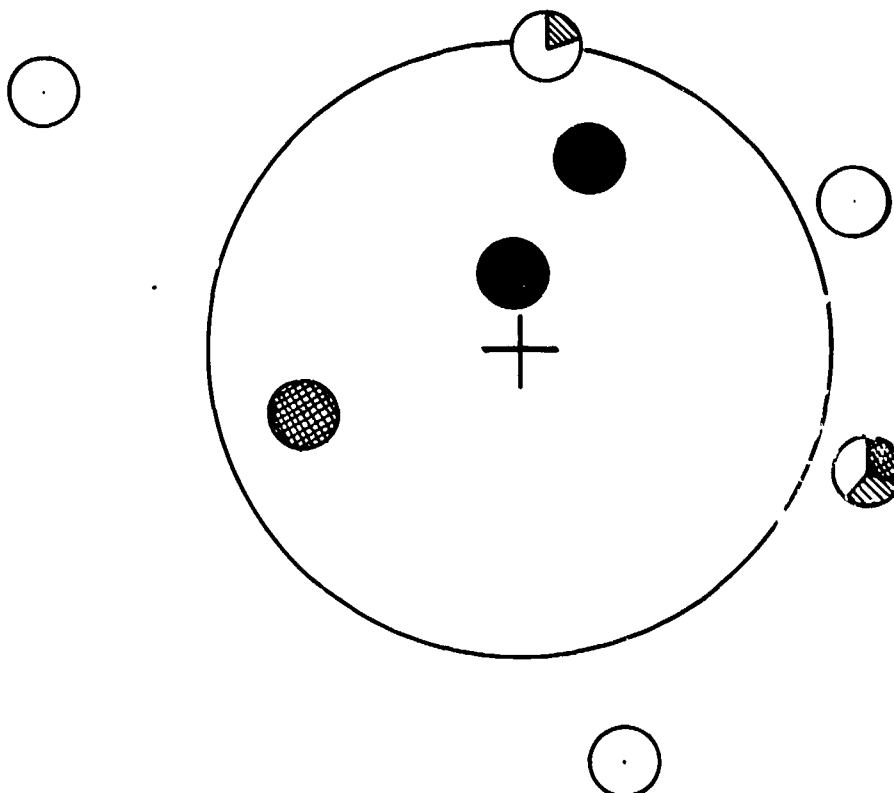
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SECRET

RANGE CIRCLE - 1000 YARDS RADIUS

B



KEY

SUNK

PERCENT NOT OPERABLE

LIGHT OR
NO DAMAGE (%)

DAMAGED BUT OPERABLE (%)

(CORROSION NOT SHOWN)

8", 12" & 14" GUNS

TEST "B" MAJOR CALIBER MOUNTS & TURRETS-LOCATION & DAMAGE

ENCLOSURE (D) TO D.S.M. SERIAL 001500

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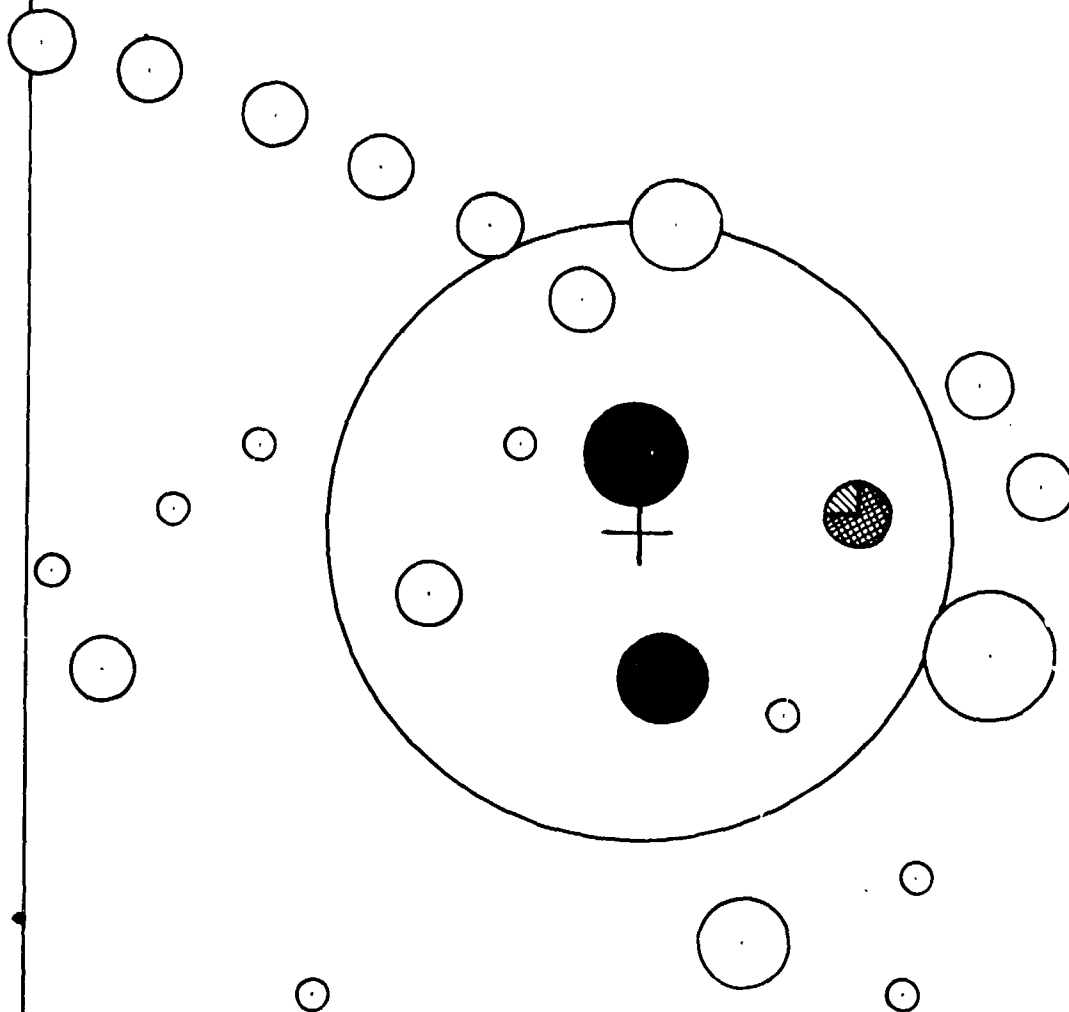
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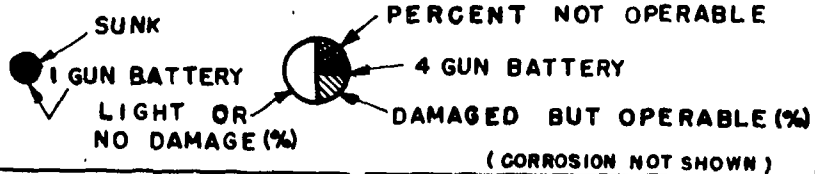
SECRET

RANGE CIRCLE - 1000 YARDS RADIUS

B



KEY



3" & 5" GUNS

TEST "B" INTERMEDIATE CALIBER MOUNTS-LOCATION, QUANTITY & DAMAGE

ENCLOSURE (D) TO D.S.M. SERIAL 001500

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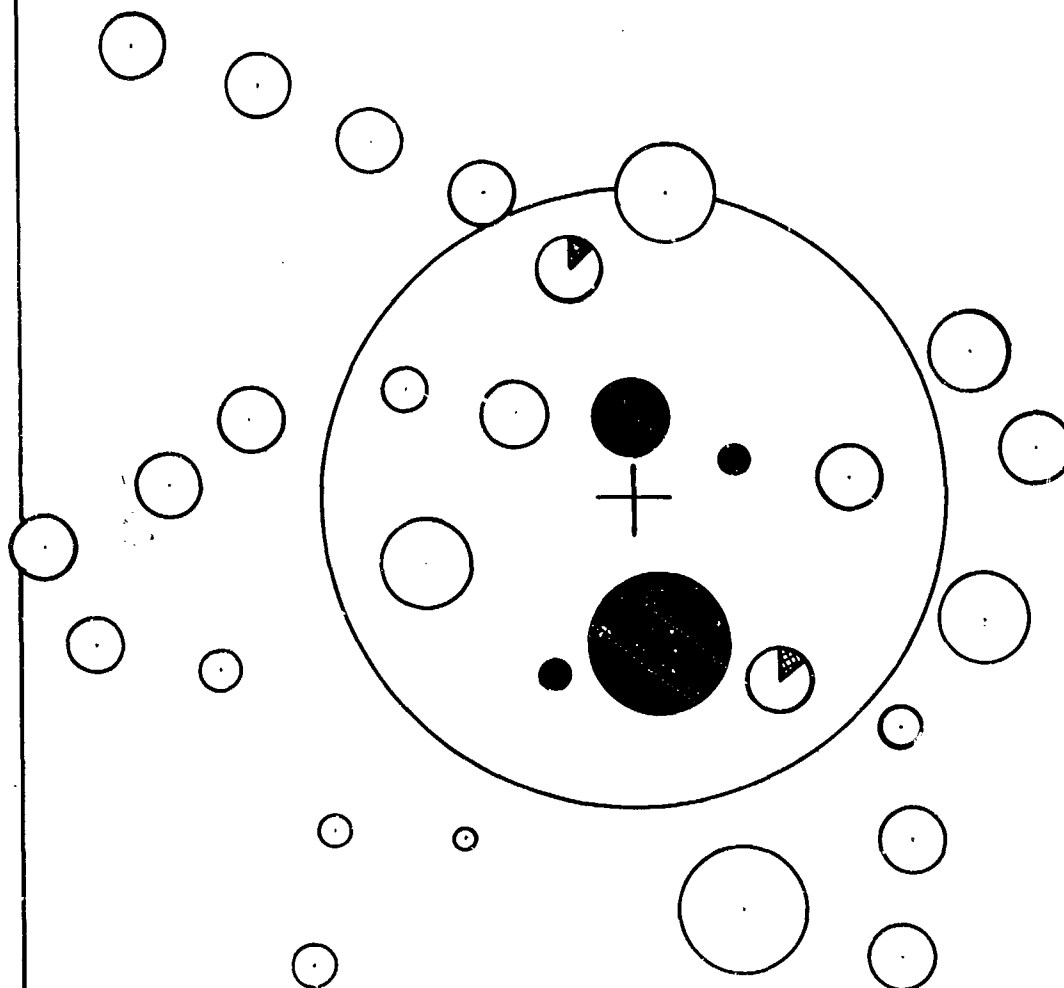
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SECRET

RANGE CIRCLE - 1000 YARDS RADIUS

B



KEY

SUNK

PERCENT NOT OPERABLE

2 GUN BATTERY

8 GUN BATTERY

LIGHT OR
NO DAMAGE (%)

DAMAGED BUT OPERABLE (%)

(CORROSION NOT SHOWN)

20MM & 40MM GUNS

TEST "B" MACHINE GUN MOUNTS-LOCATION, QUANTITY & DAMAGE

ENCLOSURE (D) TO D.S.M. SERIAL 001500

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S E C R E T

GUNS AND MOUNTS

Comparison of the effect of Tests "A" and "B".

1. The primary causes of damage in Test "A" were blast and heat. The light and intermediate caliber guns and mounts were more severely affected by these physical phenomena than were the heavy turrets. In contrast, the primary source of damage in Test "B" was shock which affected the heavy turrets far more than it did the lighter equipment. Considerable secondary damage in Test "B" resulted from the decontamination methods which were improvised to attempt to remove the radioactive materials from the vessels. These different primary causes of damage resulted in serious damage to light equipment in Test "A" with minor damage to heavy installations while in Test "B" the heavy equipment was severely affected while the lighter equipment was practically unscathed.

2. Major Caliber:- The only damage to the major caliber mounts and turrets which affected operability in Test "A" was that received by one gun of a two gun turret on the U.S.S. ARKANSAS at approximately 400 yards from the point of detonation. In Test "B" major caliber equipment was rendered inoperable on vessels remaining afloat within 900 yards of the center of explosion. Some heavy equipment was made inoperable by the second test at a distance of about 1,200 yards in the U.S.S. NEW YORK. From this data it can be deducted that the air burst was capable of damaging major caliber equipment to a range of about 400 yards horizontal range or approximately one-third of the distance to which the underwater detonation damaged heavy equipment. This comparison is based on the damage to the U.S.S. ARKANSAS ("A") and U.S.S. NEW YORK ("B") but disregards the fact that the more modern U.S.S. NEVADA was not seriously damaged by Test "B" even though it was approximately 1,000 yards from the detonation. There is no doubt that heavy equipment more seriously damaged by the underwater explosion and this is attributed to the great mass and resulting inertia involved giving rise to different moments and rates of acceleration and deceleration.

3. Intermediate Caliber (3" & 5" mounts):- In general, intermediate caliber mounts received proportionally less damage in both tests than other armament. In Test "A" structural damage occurred to an obsolete mount on the U.S.S. ARKANSAS and to a merchant-ship type mount on the BARROW at distances of 400 and 1300 yards respectively. Four mounts on the U.S.S. NEVADA at 600 yards received damage that can be readily avoided in future design by careful location of hydraulic lines. Many other intermediate caliber mounts within the above maximum range received no, or only light, damage. In Test "B" the only mounts seriously damaged were aboard the U.S.S. HUGHES at 700 yards. Other mounts damaged were only superficially. The shock from Test "B" thus had less effect on intermediate caliber mounts than the blast from Test "A" which reached out irregularly

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GUNS AND MOUNTS

3. Intermediate Caliber (3" & 5" mounts) (Cont'd)

through the air to considerable distances while leaving other nearby mounts unaffected. The results of decontamination in Test "B" were not very serious in the effect on these mounts since many were protected by shields and even when exposed the mechanisms are relatively simple and rugged.

4. Machine Guns:- The blast from Test "A" severely affected machine guns on the U.S.S. ARKANSAS, U.S.S. SKATE, U.S.S. CRITTENDEN, U.S.S. NEVADA, and U.S.S. INDEPENDENCE, all within or on the 700 yard circle. The shock from Test "B", however, had no observable effect upon the machine gun mounts. On the other hand, the secondary damage, resulting from decontamination had little or no bearing on the distance from the burst, but rather on the method of applying decontamination. This was a serious cause of corrosion and, over a period of time, resulted in considerable damage to the mounts. As a result of the lack of protection against blast and weather and also due to the relative complex nature of their exposed mechanisms, machine guns suffered more widely spread damage in the aggregate of both tests than other types of armament.

5. In considering both tests and operational damage of all types, two factors appear to be of importance. First, since future gun-loading devices will be complex and therefore strongly subject to corrosion and blast damage, they will require protection from (a) heat and blast, (b) the cascade, and (c) corrosive decontamination. It appears that this can be most efficiently provided by the use of a permanent shield such as that on enclosed 5" mounts and the gun house of major caliber turrets. If the use and design of a gun are such that it does not permit the use of a shield, then all operating parts should be designed to be simple and corrosion resistant similar to those employed in submarine mounts. The second factor that appears significant is the ratio between mass and the strength of the supporting or restraining members. This factor should be corrected by design changes which consider water-borne shock.

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SUMMARY - TEST "A"

1. Turrets and Gun Mounts on the target vessels of Test "A" received little serious damage. Practically all of the serious damage which did occur was on vessels within 600 yards of the burst and were generally isolated cases on the individual vessels. The U.S.S. SKATE and the U.S.S. INDEPENDENCE were the only vessels receiving general damage. Both had no gun mounts larger than machine guns and the submarine had but a single mount. Equipment installed on several vessels was so damaged as to render units temporarily inoperative, but capable of being repaired by the ship's forces. Minor damage to equipment from blast, not severe enough to affect operation, was widespread as was the superficial scorching of paint.

2. CAUSES OF DAMAGE - TEST "A"

The greatest damage appeared to be to structures offering resistance to (and without adequate strength to withstand) the blast, as in the case of light shields. If the shield had adequate strength the elastic deflection caused secondary types of damage in some cases. Flying debris was next in importance in causing damage and thus, again, damage to light equipment was most severe. It is probable that a third cause of damage from warping or twisting of the supporting structure of gun mounts will become apparent at the final battery alignment check. The proportion of equipment damaged in general was in inverse proportion to weight with machine guns most severely affected and turrets least.

(a) Light Equipment (Under 15 tons).

<u>SHIP</u>	<u>EQUIPMENT</u>	<u>DAMAGE</u>	<u>CAUSE</u>
NEVADA	20MM #20	Frozen train & elevation	Blast
"	20MM #17	Bent barrel & broken structure.	Flying debris
SKATE	40MM	Distorted carriage & hand-wheel	Blast and flying debris
INDEPENDENCE	40MM	Carriage trunnion distorted in such manner as to displace gun and mechanism	Blast
"	40MM	Distorted and Broken	Debris-blast
"	40MM	Loader broken	Debris-blast
"	20MM #2	Missing from ship	Blast
"	20MM #4	Missing from ship	Blast
ARKANSAS	Rocket launcher, Mk. 51	90% of launcher missing	Blast
"	20MM #8, Port	Bent barrel	Flying debris
CRITTENDEN	20MM	Bound in train and elevation	Blast.

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SUMMARY - TEST "A" (Cont'd)

2. CAUSES OF DAMAGE - TEST "A" (Cont'd)

(b) Intermediate caliber equipment was less damaged than light equipment and all damage was repairable by ship's force.

<u>SHIP</u>	<u>EQUIPMENT</u>	<u>DAMAGE</u>	<u>CAUSE</u>
NEVADA	5" twins, 1,2,7,8,	Oil lines crushed	Movement of trainer's platform, due to shock.
ARKANSAS	5"/51, center stbd. Training gear jammed air castle		Blow by casemate shutter
SARATOGA	5" twin #7	Elevation motor	Electric failure
BARROW	5" single	Train shaft parted	Blast and whip

(c) Major caliber damage was superficial except for indications of violent shock in turret #4 of the ARKANSAS and 8" mount #1 on the SALT LAKE CITY. The right gun of the ARKANSAS turret was rendered non-fireable by failure of the trunnion cap. Slide and guns of the SALT LAKE CITY mount were shifted and deck lugs and trunnions showed signs of having been sprung. The mount operated satisfactorily, however, in all respects, and was believed capable of firing. Two guns of an 8" mount on the PENSACOLA were rendered temporarily inoperative by failure of the recoil system.

RECOMMENDATIONS - TEST "A"

The recommendations which follow are made from the standpoint of removing the weakness in the equipment with due consideration for the two greatest causes of damage found in Test "A" which were blast and flying debris.

(a) The gun foundations, particularly automatic weapon sponsons, should be strengthened to prevent secondary damage to mounts. This need is illustrated by the damage to the guns and mounts on the INDEPENDENCE.

(b) The present light protective shields were designed primarily for weather protection and to protect the gun crews from the blast of their own guns. The heavy blast of the Atomic Bomb, a new factor, makes necessary a change in shield design. In making the required design changes it is recommended that shields be streamlined towards the shape of a sphere and that, when streamlining is not feasible or sufficient, stiffeners be added at or near the center of pressure. These stiffeners should be of rigid triangulated structure tending to support the whole shield. Furthermore, sufficient clearance should be left between the shields and internal units to insure that any "dishing in" of the shields will not damage the operating gear.

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SUMMARY - TEST "A" (Cont'd)

RECOMMENDATIONS - TEST "A" (Cont'd)

(c) The heavy shields now installed were designed primarily to afford splinter protection. Although the present heavy shields withstood the blast very well, it is recommended that the shields be streamlined and strengthened as discussed under (b) above in the realization that more effective atom bombs will undoubtedly be developed.

(d) All structures should be so designed as to avoid trapping the blast. Sharp corners and concave surfaces should be avoided. The structures should be completely closed, there should be no access through the shield and deann-ning scuttle hatches must be positive in action. This suggests air-conditioning in the enclosed mounts as well as positive air pressure requirements.

(e) A re-design of the 20MM firing stop mechanism is indicated by the number of mounts on which the mechanisms jammed and thus made the gun immovable in train and elevation. Present stop mechanisms should be modified to permit rapid disengagement in case this casualty occurs, but this should not decrease the positive action of the cam.

(f) The strength of supporting structures and decks should be critically examined in all cases of new construction and special attention should be paid to this phase in the modernization of vessels. The possible modernizing of the anti-aircraft battery of such types of vessels as the CL-144 class and the CA-139 class with the exchange of 20MM and 40MM for 3"/50 caliber twin mounts as an intermediate installation with the intent of finally equipping the vessels with the heavier 3"/70 twin gun mount is an example of the need for this critical examination.

SUMMARY - TEST "B"

Heavy damage to turrets and gun mounts resulting directly from Test "B" was restricted to the NEW YORK, PENSACOLA, and HUGHES. The latter two were within the 700 yard circle while the NEW YORK, at approximately 1200 yards was exceptionally vulnerable due to the condition of her armament. The PENSACOLA, HUGHES, and FALLON were the only surviving surface vessels within the 700 yard circle.

General damage to a battery of the surviving target vessels was sustained only on the PENSACOLA where the main battery was affected and the HUGHES where the 5" battery received most damage. It is probable that personnel would have been seriously injured by exposure to the radioactive cascade or, if protected from the cascade, by the shock effects.

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SUMMARY - TEST "B" (Cont'd)

CAUSES OF DAMAGE - TEST "B"

Explosion damage from Test "B" in all cases resulted from shock which was generally transmitted from below in a vertical direction. This type of damage affected heavy equipment, such as turrets, more severely than that of medium weight, as 5"/38 gun mounts. Light equipment was not affected. Indirect damage resulting from Test "B" was primarily the result of decontamination procedures (employed to remove radioactive surface material) and was most severe on open mounts. Corrosion caused by lye and salt water, together with the jamming of some equipment resulting from the application of high pressure streams were the major factors, while exposure to repeated wetting and drying from the weather and a complete lack of maintenance were highly contributory factors. Superficial damage to two machine guns on the GASCONADE is attributed to a collision shortly after Test "B" with the sinking SARATOGA.

SHOCK DAMAGE - TEST "B" - (Heavy and medium equipment)

(a) Holding down clips were damaged in the 8"/55 mounts of the PENSACOLA and 14"/45 turrets of the NEW YORK and NEVADA. There were indications of contact between the holding down clips and the fixed structure in the 5"/38 mounts of the HUGHES, where an increase in clearance was measured, and in one 14"/45 turret of the PENNSYLVANIA where imprints of the holding down clips was found in the grease on the underside of the roller path.

(b) Shifting of the rotating structure on the roller path rendered inoperable the training gear of the four 8"/55 mounts of the PENSACOLA.

(c) Elevating mechanisms were damaged in the 14"/45 turrets of the NEW YORK, and an 8"/55 mount of the PENSACOLA. In each case the housing of the oscillating nut had given away.

(d) There was damage to the trunnion securing structure in the 5"/38 mounts of the HUGHES.

(e) Certain lower elements of the mount which are an integral part of the rotating structure came into contact with the fixed structure of the mount and were distorted by this contact. This occurred on 8"/55 mounts on the PENSACOLA and 5"/38 mounts on the HUGHES.

(f) There was damage to those breech mechanisms of the 8"/55 guns of the PENSACOLA that were open at the time of Test "B".

(g) Weather seals were destroyed on the PENSACOLA 8"/55 mounts.

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SUMMARY - TEST "B" (Cont'd)

DECONTAMINATION DAMAGE - TEST "B" (Medium and light equipment)

(a) Elevation and train was rendered unusable in manual in 5"/38 mounts of the STACK by corrosion, as was the elevating gear of the 5"/38 mount on the GASCONADE.

(b) The foot firing mechanism of the 5"/38 mount of the BRACKEN was corroded and inoperable.

(c) There were many observed cases of machine guns rendered inoperative by corrosion. In all cases these could have been saved by attention and maintenance, which was impractical due to radioactivity. Decontamination practice included the use of lye and boiler compound applied in water streams of considerable pressure. This tended to remove the naturally protective greases and paints and to encourage corrosion. Machine guns which were operable after Test "B" aboard the NEW YORK were frozen eight days later and aboard the HUGHES, where decontamination measures were more vigorously applied, were frozen one day later. Whereas, on the FALLON where no decontamination was used, machine guns were operable four weeks after Test "B", although showing signs of corrosion from exposure and lack of maintenance.

(d) Damage from the pressure of a stream of water used in decontamination was sustained by 20MM mounts on the MAYRANT and GASCONADE. These were frozen in elevation and train by the firing-stop mechanism which had been forced by violent motion of the mount under the impact of the stream. A 5"/38 shield and gun port sheath on the MAYRANT were bent by water pressure.

RECOMMENDATIONS - TEST "B"

The recommendations which follow are made from the standpoint of strengthening the equipment against the two greatest causes of damage found in Test "B" which were shock and corrosion.

(a) It is recommended that design investigations be undertaken to permit turret and mount structures to accept shock at least as great as that of gun-fire but from other directions, primarily from below. This must be applicable at any angle of elevation and train for turrets and mounts to be militarily effective.

(b) As a corollary to the above, it is recommended that the design of bearings be investigated specially and separately. In the modernized 8"/55 mount (#3) of the PENSACOLA the train bearings were in place, since the roller bearings being an integrated unit, shifted as the mount shifted, but in another mount (mount #2) the ball bearings being in sections, fell free when the vertical pressure was released.

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SUMMARY - TEST "B" (Cont'd)

RECOMMENDATIONS - TEST "B" (Cont'd)

(c) It is recommended that more efficient closures or shields be provided to protect the equipment from interior contamination and corrosion and personnel from exposure to the radioactive cascade.

(d) It is recommended that stainless steels, monel, or other corrosion resistant alloys be used in guns mechanisms and moving parts. It is suggested that design criteria applying to materials used in submarine mounts are applicable to mounts designed against decontamination procedures.

(e) Provision should be made to protect personnel from breathing contaminated air or air loaded with particles resulting from evaporation of the cascade water. This indicates that air-conditioning and filtration of air should be adopted.

(f) Mount and turret structures should be integrated in contour with all other topside and deck structure to provide for efficient run-off of the cascade and channelized to provide for rapid drainage of water bearing radioactive materials with consequent increased efficiency in decontamination.

CONCLUSIONS - TEST "A" AND "B"

The results of the two tests on gun mount and turret equipments show that personnel and equipment must be protected by shields against the heat and blast of Test "A" and the cascade of Test "B". Shields must be complete and streamlined and the whole upper surface of vessels must be integrated in these respects. Second, the value of heavy equipment in the light of Test "B" is again open to question. The possibility of using alternate types of ordnance equipment with lighter weight, yet assuming the function of the main battery must be extensively considered. Third, the power supply must be as reliable as the equipment it serves, which may mean that individual sources of supply for each unit may be necessary, or that the main power plant of the vessel be of a type that requires only relatively small openings to the outside atmosphere. Fourth, the magnitude of the accelerations in both tests make it probable that special shock-absorbing means would be necessary to raise the survival chances of personnel to equal that of equipment and makes necessary investigation of the extension of remote control methods to even further extents than now considered feasible.

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Enclosure (D)

Subject: Bureau of Ordnance Material
Group Final Report for
Tests "A" and "B".

PART VI - UNDERWATER ORDNANCE

Planning
Preparation and Inspection
Equipment exposed to test
Test "A"
Test "B"
Summary

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S-E-C-R-E-T

PLANNING:

In February 1946 the Underwater Ordnance Unit compiled for the CROSSROADS Operation a list of types, quantities and test condition of specially prepared "Research" torpedoes and special underwater weapons. These were at that time the only torpedoes, weapons, etc. proposed for loading in target vessels. This list also covered the proposed types and quantities of auxiliary explosives components such as detonators and impulse charges. It was requested that torpedo workshop facilities and personnel at least equivalent to those of a modern submarine tender be made available.

When the Underwater Ordnance Unit was organized, the first plan was to supply all torpedoes and associated equipment from various supply centers in the continental United States. Most of these centers were located on the East coast. It was later decided that the Pearl Harbor area had a sufficient back log of torpedoes to provide most of those required for the tests. The Bureau of Ordnance therefore requested the Commander in Chief, Pacific Fleet to make the required material available. However certain additional material was needed from depots on the mainland and supply orders were initiated in the latter part of February to Naval Mine Depot, Yorktown, Virginia, Naval Ammunition Depot, Hawthorne, Nevada, Naval Torpedo Station, Keyport, Washington and Naval Air Station, Alameda, California to ship equipment to the Pearl Harbor area. In addition certain warheads were shipped from Hawthorne, Nevada to Yorktown, Virginia, for inert loading.

The prohibition of the use of torpex-loaded warheads was recommended by the Bureau of Ordnance in February 1946. It was proposed on the same date that since the overhaul of 480 torpedoes would be prohibitive in view of personnel and facilities actually available, overhaul of service allowance torpedoes be omitted and all efforts concentrated upon the preparation of "Research" torpedoes for the test. Instructions for the preparation of "Research" torpedoes for the SARATOGA and INDEPENDENCE were promulgated early in March 1946.

A pamphlet which contained all information necessary for the proper preparation and loading in target vessels of all torpedoes and special weapons was prepared by the cognizant research section of the Bureau of Ordnance and was distributed to the field groups to govern their subsequent operations. The conditions of loading and special arrangements for Submarine, Destroyer and special torpedoes are not set forth in the following paragraphs.

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PLANNING: (Cont'd)

Submarine Torpedoes

A distribution with respect to mark and modification was made of special test submarine torpedoes throughout the submarines so as to expose the torpedoes at various distances. The muzzle door of one stern tube containing a torpedo was to be open on each of two submarines. This procedure was adopted in order to determine the result of the direct exposure of a torpedo and its tube to the effects of the Atomic Bomb explosion. All special test torpedoes were to be supplied with inert warheads but live exploder mechanisms. Vessels carrying special test torpedoes in addition to a full complement of service allowance torpedoes had the loading modified to the extent that only the warheads of the service allowance torpedoes were loaded thus keeping the percentage of explosive aboard unchanged.

All air leads were to be capped to prevent pressure leaks thus precluding any possibility of the torpedo making a run. Various compartments were to be filled with liquids containing different colored dyes so that leaks could easily be detected and identified. Unit cell batteries in torpedoes were not to be filled with electrolyte in order to eliminate the possibility of hydrogen explosions in the torpedo tubes of the submarines.

Upon arrival at Pearl Harbor, it was decided that prior directives should be altered to require that the tripping latches of torpedo tubes in submarines be lashed in the "UP" position in order to prevent their engaging the starting levers if the torpedoes should surge in the tubes. This procedure places the tripping latches in the position specified by an authorized but as yet unissued OrdAlt.

Aircraft Torpedoes and Special Weapons

It was specified that aircraft torpedoes be placed in aircraft carriers in normal stowages with flasks charged. Torpedoes were to be placed in aircraft with uncharged flasks. The special test torpedoes were to be equipped with inert heads and live exploders.

Special weapons containing inert warheads and live exploder mechanisms were also to be placed in normal shipboard stowage and in airplanes. Other special weapons were to be placed on the sterns of destroyers carrying special test torpedoes.

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S E C R E T

PLANNING (Continued)

Destroyer Torpedoes

In general, it was specified that the service load torpedoes be equipped with live warheads and dummy exploders, while special test torpedoes with inert heads were to be equipped with live exploders. Test torpedoes were to be distributed in vessels carrying a low percentage of the normal allowance of regular service torpedoes. In order to prevent runs, the ignition air lead was to be left disconnected on all torpedoes. Tubes containing service allowance were to be trained outboard so that the torpedoes would be scuttled in the event of breakage of a tripping link. Test mounts were trained to stowed position.

Firing hammers were to be placed in various conditions of readiness. Detonators, boosters and impulse charges were to be placed in their normal stowage in order to ascertain their behaviour under normal stowage conditions.

Some empty torpedo tubes were to contain standard impulse loads and live primers with firing hammer ready in order to approximate ready-to-fire conditions.

Changes to Preliminary Plans

Original plans were made on the assumption that explosives and combustibles would be present only in token quantities in the target vessels. Final plans called for loading of from 10% to 100% of normal allowance.

In late January the Bureau of Ordnance proposed that several muzzle doors of loaded torpedo tubes in target submarines be left open during the test provided that adequate salvage facilities were available. As an alternative the Bureau of Ordnance suggested that torpedo tubes be mounted in about five salvage pontoons. These pontoons were to be distributed in the target array. The tubes were to be loaded, and the muzzle doors to be left open during the test. The first proposal was accepted and it was planned to leave the muzzle doors open in the APOGON and DENTUDA on one loaded after tube in each ship.

It was proposed by the Bureau of Ordnance that four special net sections be placed so as to determine the effect of the Atomic Bomb on such material, in both tests "A" and "B", and details were furnished concerning the various components proposed to be included in the installation. However, a decision was made by Joint Task Force ONE not to submit any new installations to the CROSSROADS tests.

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PLANNING: (Cont'd)

Changes to Preliminary Plans
(Cont'd)

The Bureau of Ordnance further suggested that six explosive warheads and six torpedoes with inert heads be suspended from buoys to average torpedo running depths and at safe distances from the target vessels. The object of this test was to determine the effect of the explosion of an Atomic Bomb on torpedoes under actual operating conditions. It was also suggested that warheads containing different types of explosives be exposed on the decks of target vessels during the tests. It was further proposed that a moored mine field be subjected to the effects of the Atomic Bomb explosion. These proposals were all rejected by Commander Joint Task Force ONE.

When the moored mine field proposal was rejected because of its danger to traffic in the lagoon a substitute plan was issued which provided that mines of a type representative of all United States Navy mines be placed on the open deck of certain vessels at varying distances from the burst to obtain a gradation of damage. These mines were inert loaded but all mechanisms, detonators and boosters were in place. Various types of test depth charges and service load depth charges were also placed in target destroyers at various distances from the center of the array. The test charges were all inert.

Mines Mark 6

It was planned to have seven Mines Mark 6 in each test and to place the mines on the deck of target ships at varying distances from the center of the array. Six of these mines were placed on the weather deck of transports at frame 40 on the starboard side. The remaining Mine Mark 6 was placed on the main deck at frame 100 starboard side of the Japanese Battleship NAGATO. All mines were plaster loaded, containing inert boosters and service detonators. An attempt was made to simulate as nearly as possible the condition that would exist in the transport of mines by a mine layer.

All safety devices such as fifth wheel pin, shorting out clip, extender lock nut, hydrostatic release safety pin, K device, hydrostatic lock nut and K device splash cap were left in place on the mine. The dash pots were filled and parachutes rigged. The electrical system for each mine was checked and found to be correct before the installation of the detonators. The mines were given a thorough check and all components were in excellent shape.

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PLANNING: (Cont'd)

Depth Charges

The special test depth charges were plaster loaded with service loaded pistol and extender containing loaded booster and detonator except for the Mark 14, which had an empty booster can. All service allowance charges were assembled without boosters and detonators to minimize the danger should any charge fall overboard or be sunk with a target vessel.

Charges in the stern racks were fitted with knocking off caps and forks, those in K-guns and side racks were fitted with shipping caps and forks. Charges that were in stowage (service allowance) were left with the blanking off plates on. In ships where less than a full load was carried, the charges were distributed so as to place representative ones in each location. In all ships the Mark 8 and Mark 14 charges were placed in the stern racks.

Each of the special test depth charges were given an operational test and checked prior to Test "A".

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Destroyers

During each phase, the seven (7) destroyers carrying the least quantities of service explosives material carried a complete set of special torpedoes test material in accordance with the list which follows:

Torpedoes MK-15 MOD-3	2
Exploders MK-6 MOD-5	1
Exploders MK-10 MOD-3	1
Detonators MK-7	3
Detonators MK-9	3
Boosters MK-2	1
Torpedoes MK-27	1 (Special Weapons)

(a) Torpedoes, MK-15 MOD-3:

Each torpedo was assembled with a special inert-loaded War Head MK-17 MOD-2 or 3 and an Exploder MK-6 equipped with a dummy booster MK-2 and a detonator MK-9 having no charge other than the detonator caps. Exploders were installed unarmed. An Igniter MK-6 MOD-2 was installed in each torpedo. The igniter air lead was not connected to the igniter, of which the air connection was securely capped to prevent the entrance of pressure from any source. Fuel tanks were filled with fresh water colored with seamarker dye (so that fuel tank leaks could readily be detected). Stop valves were opened only 1/4 to 1/2 turn. The torpedoes were otherwise in all respects ready for a War Shot. All adjustments were made and recorded in records at Destroyers Pacific Torpedo Shops - KUAHUA Island, Pearl Harbor, T.H., by shop personnel assisted and checked by personnel of Staff, Director of Ship Material (Assistant for Bureau of Ordnance.) Exploders for these torpedoes were first at Destroyers Pacific Shops prior to installing in those torpedoes as they were loaded directly into target vessels at Pearl Harbor, T.H. Replacement exploders which were carried in U.S.S. DIXIE (AD-14) were tested, both at Destroyers Pacific Shops and again prior to installation at Bikini. All exploders, recovered after the tests were given a cursory examination in the U.S.S. DIXIE (AD-14) to expedite "Overall Damage Reports" immediately after each test and a thorough analytic overhaul, including all prescribed bench tests, at Destroyers Pacific Shops after both tests were completed. All exploders passed all tests and no damage was noted from either Test "A" or "B". No detonators fired in either Test "A" or "B".

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Destroyers (Cont'd)

(b) Exploders.

One unarmed exploder MK-6 MOD-5 and one cocked and unarmed MK-10 MOD-3, boxed and securely lashed were placed in the torpedo work shop of each of the designated target destroyers carrying special torpedo test materials. These exploder mechanisms were removed for test and examination after Test "A" and replaced for Test "B" by other exploder mechanisms carried as replacements in U.S.S. DIXIE (AD-14). All exploder mechanisms MK-10 MOD-3 were given a visual examination to check any damage - prior to shipping them to the Naval Ordnance Laboratory, Washington, D.C. for a more thorough test. All exploder mechanisms MK-10 MOD-3 were found in excellent material condition after both Test "A" and "B".

(c) Detonators.

Detonators were carried in their normal stowage containers and in every case were found to be in perfect condition after each test, in fact even where the bulkheads and superstructure were severely damaged, the detonators stowed in the immediate area were found to be in perfect condition. These however were forwarded to Naval Torpedo Station, Keyport, Washington for routine test and report on same.

(d) Boosters.

The Warhead boosters were stowed in magazines, compartments, as remotely as possible from other explosive or combustible material. All boosters passed through both Test "A" and "B" without any damage.

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Table 1

Project "CROSSROADS" - Special Torpedo Test Materials
Assignment (Both Phases) Destroyers

Item	Quantity	Normal Stowage	Tubes	Deck	Torpedo Work Shop
Torpedo - MK 15 MOD 3	24		24		
Warheads MK 17 (Inert)	24		24		
Exploder MK-6-5	12				12
Exploder MK-6-6	22		24		
Exploder MK-10-3	12				12
Detonators MK-7 (Exp. MK-10)	42	42			
Detonators MK-9	68	68			
Detonators MK-9 (Dummy)	24		24		
Igniters MK-6-2	48		48		
Batteries MK-6-2 (Exploder MK-10)	12				(In Exploder) 12
Boosters MK-2	12	12			
Boosters MK-2 (Dummy)	24		24		

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PREPARATION AND INSPECTION OF UNDERWATER ORDNANCE MATERIAL

All underwater ordnance items of like type were prepared in the same manner for both tests. Most items for Test "A" were loaded aboard target vessels at Pearl Harbor and either placed in position for display in Test "A" or stowed and placed in the displayed position after the arrival at Bikini. Replacement items for Test "B" were loaded in the U.S.S. DIXIE (AD-14) the U.S.S. FULTON (AS-11) and U.S.S. ARTEMIS (AKA-21).

The shops of the U.S.S. DIXIE (AD-14) were utilized to the fullest extent for destroyer torpedoes. Likewise the shops of the U.S.S. FULTON (AS-11) were utilized for submarine and aircraft torpedoes and special weapons. All items were thoroughly prepared prior to loading on target vessels or ships used as transports of material for Test "B". Upon arrival of the target ships and tenders at Bikini routine checks were constantly made on all items on the target ships to assure the best possible conditions could be obtained and personnel aboard the target ship familiarized with the nature of tests being performed on individual items.

After Test "A" shipboard checks were made by staff personnel and representative items removed for analysis in the shops of the tenders or stowed for shipment to shore activities. Portable test sets were used to check depth charges and the mines Mark 6 aboard the target ships.

Items removed for shop analysis after Test "A" were replaced with like items from the supply on board the tenders for Test "B". Routine checks were constantly made up to evacuation day as was done for Test "A".

The shipboard checks and tests made after Test "B" were by necessity, made very cautiously because of the condition of the target vessels. Such items as was possible were removed, decontaminated and then given a shop analysis. Considerable damage had been caused by the time and the decontamination methods used.

PREPARATION PROCEDURES FOR DESTROYER TORPEDOES

Information contained in the instructions titled, "Test Procedures for Above-Water Torpedo Tubes", dated 5 March 1946, and the pamphlet, "Instructions to Target Vessels for Test and Observations by Ship's Force", issued by Director of Ship Material - (Assistant for Bureau of Ordnance) together with letters and dispatches forwarded to Joint Task Force ONE, form the complete directive regarding Tests for Under-water Ordnance items in Destroyers.

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PREPARATION PROCEDURES FOR DESTROYER TORPEDOES (Cont'd)

All torpedoes and torpedo equipment were prepared for test in accordance with current directives and procedures then in effect and as issued by the Bureau of Ordnance and Fleet Commanders except as noted herein.

ABOVE WATER TORPEDO TUBES - TORPEDO HANDLING EQUIPMENT

Due to post-war activity in regards demobilization and decommissioning of certain vessels it had been realized that all A-W Torpedo Tubes would not be in perfect working condition, however it was deemed possible to prepare such ships with minimum amount of expenditures, both momentary and physical labor and still obtain adequate results.

Where torpedo tube barrels were found dented, out of alignment or damaged to such extent that loading was impossible no steps were taken to effect repairs but the barrel was utilized to carry out Impulse Mechanism tests.

The training gear on all torpedo tubes were inspected, tested, greased and repaired where necessary, but only to the extent of direct drive-in train. Where hydraulic gear was inoperable no steps were taken to overhaul or repair as this would undoubtedly involve spare parts and extensive labor. Where hand clamps or automatic breaks were inoperative due to damaged parts, pad eyes were welded in place on deck and wire bridles of suitable strength were rigged to hold the tubes in the required position for the tests.

Director repeater instruments on tubes were checked and repaired as deemed necessary but as in other parts only to the extent that such parts and labor as were at hand. All damage was checked on Above-Water Torpedo Tube Check Off Lists which were prepared at time of ships inspection by the Director of Ship Material Staff Personnel before and after each phase of the operation.

Electrical circuits of all torpedo mounts were checked for grounds etc. and those requiring repairs were overhauled and put in a fully operative condition.

Many of the target vessels had started decommissioning and had removed detonators and ready ammunition stowage boxes which had to be replaced by yard forces.

Torpedo trolley hoists were missing on a number of the target destroyers and were replaced by such hoists as could be obtained from other ships being decommissioned at Pearl Harbor, T.H. In most cases only one hoist could be supplied to a ship which necessitated transferring the hoist to whichever side was being loaded.

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ABOVE WATER TORPEDO TUBES - TORPEDO HANDLING EQUIPMENT

All torpedoes used in Test "A" were prepared and loaded at Pearl HARBOR, T.H. by crews from Destroyers Pacific Torpedo Shops, Pearl HARBOR, T.H., assisted and directed by Director Ship Material (Assistant for Bureau of Ordnance) Staff Personnel. A YSD type crane was used, which permitted direct loading of a complete torpedo into tube barrels.

Replacement torpedoes used in Test "B" were prepared and loaded by personnel from U.S.S. DIXIE (AD-14) assisted and directed by Director of Ship Material (Assistant for Bureau of Ordnance) Staff Personnel at Bikini.

PREPARING TORPEDO TUBES FOR TEST

(a) For each phase of the test, torpedo tubes were reconditioned as time and conditions would permit. Photographs were taken before Test "A" of all torpedo tubes. After Test "A" only ships sustaining damages were photographed and from same angles as before, for comparison. Additional photographs as deemed necessary were also taken for record.

(b) Loading Condition of each Torpedo Tube as prescribed in this section was carried out.

1. For ships having both standard service torpedoes and special test torpedoes, the loading of torpedoes is indicated on the attached loading charts.
2. For ships having only standard service torpedoes, the number of torpedoes is indicated on the attached loading plan. The firing mechanisms condition as indicated in section 5 (a) and the condition of train as indicated in section 6 (a) or 6 (b) of pamphlet "Project CROSSROADS" Test Procedure for A-W Torpedo Tubes issued by the Director of Ship Material (Assistant for Bureau of Ordnance) was carried out and subparagraph identification numerals are used to identify type of load in each firing mechanism and position of train of tubes in this report.

(c) The standard service torpedo is any standard torpedo Mark 15 type ready for war shot with a T.N.T. loaded head. The special test torpedo is a Mark 15 Mod 3 type equipped with Warhead Mark 17 Mod 2, or Mark 17 Mod 3 (inert loaded), Exploder Mechanism Mark 6 Mod 6 (unarmed), Detonator Mark 9 (no charge other than detonator caps), Booster Mark 2 (dummy), and Igniter Mark 6 Mod 2.

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PREPARING TORPEDO TUBES FOR TEST (Continued)

(d) In addition to the normal method of securing the torpedo in the barrel, all special torpedoes were secured by reeving a 3/4" steel cable through the nose ring, running it around the saddle and the two ends secured by cable clamps, allowing slack enough in cables to permit torpedo to travel approximately 6" in the tube.

FIRING MECHANISM

Firing mechanisms were prepared and loaded in accordance with directive set forth in pamphlet "Project CROSSROADS". Test Procedure for above water Torpedo Tubes, section 5 subparagraph (a to f) issued by Director of Ship Material (Assistant for Bureau of Ordnance) and set forth herewith.

- 5 (a) Firing Mechanism - empty.
- 5 (b) Firing Mechanism with standard loaded impulse case, firing circuit connected - Firing Hammer "READY" - "NO PRIMER".
- 5 (c) Firing Mechanism with "EMPTY" impulse case, live primer, firing cable disconnected and firing hammer set "SAFE".
- 5 (d) Firing Mechanism with loaded impulse case, live primer, firing circuit connected and energized. Firing hammer set "SAFE".
- 5 (e) Firing Mechanism with loaded impulse case, DUMMY PRIMER - firing circuit disconnected and firing hammer set "READY".
- 5 (f) Firing Mechanism with loaded impulse case, DUMMY PRIMER, firing circuit disconnected and firing hammer set "READY".
- 6 (a) Empty tubes were trained to a "stowed" position, centering pins engaged and Hand Brake "ON".
- 6 (b) Tubes loaded with standard service torpedoes, were trained "outboard", Hand Brake "ON", all spindles disengaged and tripping latches locked "UP".
- 6 (c) Tubes loaded with special test torpedoes were trained to a "stowed" position, centering pins engaged, Hand Brake "OFF", all spindles "DISENGAGED" and tripping latches locked "UP".
- 6 (d) Tubes loaded with both standard service torpedoes and special test torpedoes were trained "OUTBOARD", Hand Brake "ON", all spindles "DISENGAGED" and tripping latches "DOWN".

SPECIAL TEST OF DESTROYER TORPEDO MATERIAL

1. In Operations CROSSROADS, torpedoes and associated equipment were placed on board destroyers in target vessel group for two purposes:

- (a) to duplicate varying degrees of service loading so that the target vessels will be subjected to as nearly as practicable the same hazards that might be obtained under war conditions.

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SPECIAL TEST OF TORPEDO MATERIAL'S DESTROYER (Cont'd)

- (b) To determine the effect of the bomb test upon the various component parts of special torpedoes where practicable and to distinguish such effects from other occurrences such as magazine explosions or severe fires.

This report is concerned primarily with 1 (b). The special torpedo test material listed in Table 1 was supplied for the second purpose (b) and was therefore concentrated predominately, so far as was practicable, in vessels having the least amount of the standard ammunition allowance on board. Where such concentration was not practicable, the special torpedo test material of Table 1 was placed as remotely as practicable from explosive material and material capable (either from its character or its quantity) of promoting a large, hot fire. This material (Table 1) was carefully placed in the fully ready condition for war use prior to test, subject only to differences noted hereinafter and to the qualification that material located otherwise than actually in a torpedo tube shall be in a condition of readiness appropriate to its actual location. After each phase of the test all of the non-explosive material of Table 1 which was not lost or destroyed and which showed any signs of receiving damage was removed from target vessel to destroyer tender where it was disassembled and analyzed to the extent necessary to determine whether or not it was still operative and if not what component had failed and how. Torpedo material placed in any target vessel as part of a standard ordnance allowance or any fraction thereof (i.e. for purpose outlined in (a) above) was not to be overhaul or analyzed either before or after either phase of the test, however - in the case of the U.S.S. HUGHES and U.S.S. ANDERSON - exceptions were made and damaged torpedoes from both of these vessels were disassembled and analyzed after tests. Photographs of damage were taken and recorded along with data from the overhaul shops.

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Preparation of Submarine Torpedo Tubes and Stowage Spaces

1. Submarine torpedo tubes were given a thorough check as to material and mechanical efficiency prior to loading. Micrometric measurements were taken of the tubes, worn parts replaced and such adjustments made as was consistent with uniform alignment. The tubes were thoroughly cleaned and lubricated and all working parts such as speed spindles, depth spindles, and gyro settings were lubricated and checked several times for proper operation. Tripping latches were disconnected at the operating lever and wired in the "UP" position. All of the automatic drain valves in the bottom of the firing valve casings were removed and bronze pipe plugs submitted. Poppet valves and the linkages were worked several times under air pressure after the gags had been made fast. Shutter and door clearances were recorded from the ship's log (when available) and breech and muzzle door gaskets inspected and replaced where deemed necessary. A list of completed OrdAlts for each installation was recorded.

2. Impulse pressure for these tubes was built up to 300 P.S.I. for a ten minute drop test. A maximum of 10% drop per hour was allowed for all tubes except those which were to hold pressure during test where a maximum tolerance of 2% in four hours was obtained. Firing valves were fired "inboard" with 50 P.S.I. pressure to check operation.

3. An inspection of loading and stowage spaces was made and showed that some of the submarines required snubbing and lowering away lines, hooks, securing straps for the cradles and other equipment which was either supplied or manufactured.

4. After all adjustments, replacements, lubrication and checks had been made in order to obtain the best operating condition possible of these tubes, torpedoes of various marks and modifications including all those regularly issued at the end of the war and some more recent research models were loaded in the tubes and cradles of the target submarines.

Torpedo Tubes

1. An examination of all torpedo tubes, torpedo tube components and associated parts made after Test "A" on each submarine. This examination was not complete inasmuch as all torpedoes were not unloaded as originally planned because there was no apparent torpedo damage. One or two sample torpedoes were removed from the tubes of each submarine and a complete examination obtained on each of the tubes thus emptied. It was determined that no tube had fired during test and that the pressure drops in the impulse systems were such as to indicate any damage except in the U.S.S. SKATE. The following tubes (originally empty) were checked in detail for comparison with former readings.

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Torpedo Tubes (Cont'd)

- (a) SKIPJACK Tubes - No. 4 and 5.
- (b) APAGON Tubes - No. 5, 6, and 7.
- (c) SKATE Tube - No. 1.

Damage to U.S.S. SKATE

1. The No. 8 Tube flooded due to a damaged door or shutter. It was necessary to trim the ship and bring the muzzle door above the water line before the torpedo could be removed. The torpedo was then removed without difficulty and showed no damage.

2. Examination inside the tube bore of the No. 8 tube and outside around the muzzle door opening mechanism, showed the following damage:

The muzzle door was pushed off its gasket and inboard and downward approximately $3/8$ of an inch. The upper edge of the door on the upper outboard quarter was sprung $5/32$ of an inch and inspection showed that the crushed shutter and distorted hinge arms both on the door and shutter held it in the closed position with great strain. No attempt was made to operate either door or the shutter. Further inspection showed that the rollers and tracks had been pulled away from the superstructure. The new type T-lip muzzle door gasket had been installed in this installation and this type of gasket has very little material for water tightness, once misaligned. The old type wedge gasket is held in place by the bead on the end of the tube and gives strength which in this case might have held the door in place and the bending or twisting may have occurred in other parts thus leaving the tube water-tight. The horizontal plating on the tube flats was bulged in at the center. No attempt was made to go into the after trim tank or down between spaces to inspect for further damage, due to conditions which obtained in the area.

3. Damage to hull below the waterline is indicated by the tube diameters taken on tubes No. 8 and 10 showing a decided amount of "out roundness" and flattened portions of the tube near the muzzle as follows:

Tube No. 8

(12" from muzzle end)

<u>Vert.</u>	<u>Horiz.</u>
Before 21.126	21.124
After 21.178	21.070

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Damage to U.S.S. SKATE (Cont'd)

Tube No. 8

<u>Vert.</u>	(69" from muzzle end)	<u>Horiz.</u>
Before 21.123		21.121
After 21.126		21.124

Tube # 10

	(12" from muzzle end)	
Before 21.131		21.125
After 21.311		21.127

(69" from muzzle end)

Before 21.124	21.121
After 21.200	21.127

These tubes were worn from service and the plan size of 21.125 plus .020, minus .000 does not hold true, however the figures show a change of approximately .100" in some spots near the muzzle end on tubes # 8 and # 10. Also where the middle and muzzle section of the tube are rivited together the vertical readings changed from 21.131 to 21.225 in diameter. The diameter at this point is near the bulkhead ring and it is considered possible that the whole stern tube nest was distorted and out of alignment as a result of the heavy stresses set up in the structural framing surrounding this area. There was considerable damage to the impulse system as follows:

- (a) The impulse pipe to the firing valve of the No. 2 system had broken away from the hangers and was bent and twisted away from its normal position. A pressure of 200 P.S.I. on this system held for 10 minutes.
- (b) In the number 4 system the impulse flask pipe was fractured from the flange joint and was leaking badly. The pipe was bent and hangers were torn loose.
- (c) The impulse flask pipe of the No. 6 system had broken away at the welded joint on the flange and was fractured at the hull joint. The pipe was twisted and the flask shifted in the support rack.

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Torpedo Stowage

Cradles in the after stowage were distorted so that they were not firm on the supports when empty. The side runner plates which held the wooden torpedo guide chocks were bent to starboard on both port and starboard cradles. Most of the locking bars were bent and had to be forced free. In some cases the forward locking assembly had to be dismantled before the cradle could be moved. All cross-rails were checked with a straight edge. In the forward room a drop in the center of the cradle was noted of a maximum of 1/4" where the portable section of crossrail attaches. In the after room a maximum drop of 3/8" was found near the center of the cradle on the starboard side. One portable section of crossrail in the aft torpedo room which was in the stowed position and attached to the side of the upper cross-rail by clamps, slid out of its position and swung inboard and struck the warhead in the opposite side lower cradle cutting a hole in the warhead casing.

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S E C R E T

MINE Mark 6 UNDERWATER ORDNANCE EQUIPMENT EXPOSED TO TEST

<u>SHIP</u>	<u>DISTANCE</u> <u>"A"</u>	<u>DISTANCE</u> <u>"B"</u>	<u>NO.</u>	<u>LOCATION</u>
U.S.S. BRACKEN (APA-64)	2200 Yds.	1800 Yds.	1	Stbd. Fr. 34.
U.S.S. BLADEN (APA-63)	2800 Yds.	2400 Yds.	1	Stbd. Fr. 34.
U.S.S. BRISCOE (APA-65)	1700 Yds.	1200 Yds.	1	Stbd. Fr. 34.
U.S.S. CATRON (APA-71)	2900 Yds.	1400 Yds.	1	Stbd. Fr. 34.
U.S.S. FILLMORE (APA-83)	2500 Yds.	2100 Yds.	1	Stbd. Fr. 34.
U.S.S. NIAGARA (APA-87)	4000 Yds.	3200 Yds.	1	Stbd. Fr. 34.
NAGATO (Ex Jap BB)	900 Yds.	700 Yds.	1	Stbd. Fr. 100.

DEPTH CHARGE Mark 14

U.S.S. CONYNGHAM (DD-419)	2100 Yds.	3500 Yds.	1	Stbd. Stern Rack
U.S.S. LAMSON (DD-367)	900 Yds.	- - - - -	1	Stbd. Stern Rack
U.S.S. MAYRANT (DD-402)	3600 Yds.	800 Yds.	1	Stbd. Stern Rack
U.S.S. MUGFORD (DD-389)	2900 Yds.	2500 Yds.	1	Port Stern Rack.
U.S.S. MUSTIN (DD-413)	2400 Yds.	1300 Yds.	1	Stbd. Stern Rack
U.S.S. RALPH TALBOT (DD-390)	1200 Yds.	1800 Yds.	1	Port Stern Rack.
U.S.S. RHIND (DD-404)	1000 Yds.	2200 Yds.	1	Port Stern Rack.
U.S.S. TRIPPE (DD-403)		1000 Yds.	2	Stern Racks.

DEPTH CHARGE Mark 9

U.S.S. CONYNGHAM (DD-419)	2100 Yds.	3500 Yds.	6	(1) Port K Gun #2 (1) Port K Gun #4 (3) Stbd K Gun #1 (1) Stbd K Gun #3
U.S.S. LAMSON (DD-367)	900 Yds.	- - - - -	6	(5) Port Stern Rack (1) Stbd Stern Rack
U.S.S. MAYRANT (DD-402)	3600 Yds.	800 Yds.	6	(3) Port Stern Rack (2) Stbd Stern Rack (1) K Gun Port Fr. 140
U.S.S. MUGFORD (DD-389)	2900 Yds.	2500 Yds.	6	(5) Stbd Stern Rack (1) Port Stern Rack
U.S.S. MUSTIN (DD-413)	2400 Yds.	1300 Yds.	6	(3) Port Stern Rack (3) Stbd Stern Rack
U.S.S. RALPH TALBOT (DD-390)	1200 Yds.	1800 Yds.	6	(2) Stbd Stern Rack (4) Port Stern Rack
U.S.S. TRIPPE (DD-403)	- - - - -	1000 Yds.	2	(1) #1 K Gun (1) #4 K Gun

DEPTH CHARGE Mark 8

U.S.S. CONYNGHAM (DD-419)	2100 Yds.	3500 Yds.	1	Stbd Stern Rack
U.S.S. LAMSON (DD-367)	900 Yds.	- - - - -	1	Stbd Stern Rack
U.S.S. MAYRANT (DD-402)	3600 Yds.	800 Yds.	1	Port Stern Rack
U.S.S. MUSTIN (DD-413)	2400 Yds.	1300 Yds.	1	Port Stern Rack

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UNDERWATER ORDNANCE EQUIPMENT EXPOSED TO TEST (Continued)

MINE Mark 8 (Continued)

<u>SHIP</u>	<u>DISTANCE</u> <u>"A"</u>	<u>DISTANCE</u> <u>"A"</u>	<u>NO.</u>	<u>LOCATION</u>
U.S.S. RALPH TALBOT (DD-390)	1200 Yds.	1800 Yds.	1	Stbd. Stern Rack
U.S.S. RHIND (DD-404)	1000 Yds.	2200 Yds.	1	Stbd. Stern Rack
U.S.S. TRIPPE (DD-403)	- - - - -	1000 Yds.	2	Stbd. Stern Rack

DEPTH CHARGE Mark 6

U.S.S. CONYNGHAM (DD-419)	2100 Yds.	3500 Yds.	1	Stbd. Stern Rack
U.S.S. LAMSON (DD-367)	900 Yds.	- - - - -	1	Stbd. Stern Rack
U.S.S. MAYRANT (DD-402)	3600 Yds.	800 Yds.	1	Stbd. Stern Rack
U.S.S. MUGFORD (DD-389)	2900 Yds.	2500 Yds.	1	Port. Stern Rack
U.S.S. MUSTIN (DD-413)	2400 Yds.	1300 Yds.	1	Port. Stern Rack
U.S.S. RALPH TALBOT (DD-390)	1200 Yds.	1800 Yds.	1	Port. Stern Rack
U.S.S. RHIND (DD-404)	1000 Yds.	2200 Yds.	1	Port Stern Rack.
U.S.S. TRIPPE (DD-403)	- - - - -	1000 Yds.	2	Port Stern Rack.

TORPEDO Mark 18, Mod. 2

U.S.S. APOGON (SS-308)	1000 Yds.	600 Yds.	2	(1)(Stbd inboard lower cradle forward.) (1)(#10 torpedo tube, muzzle door open)
U.S.S. SKIPJACK (SS-184)	1200 Yds.	1000 Yds.	2	(1)(Upper starboard cra- dle aft.) (1)(#3 Torpedo Tube.)
U.S.S. SKATE (SS-305)	400 Yds.	800 Yds.	2	(1)(Stbd inboard lower cradle forward.) (1)(#10 Torpedo Tube.)
U.S.S. PILOTFISH (SS-386)	2400 Yds.	300 Yds.	2	(1)(Stbd inboard lower cradle forward.) (1)(#10 Torpedo Tube)
U.S.S. PARCHE (SS-384)	1200 Yds.	1400 Yds.	2	(1)(Stbd inboard lower cradle forward.) (1)(#10 Torpedo Tube, rollers removed.)
U.S.S. DENTUDA (SS-335)	2100 Yds.	1200 Yds.	2	(1)(#3 Torpedo Tube, rollers removed.) (1)(Upper stbd cradle aft.)
U.S.S. TUNA (SS-203)	2200 Yds.	1700 Yds.	2	(1)(Upper stbd cradle aft.) (1)(#3 Torpedo Tube.)

S E C R E T

Enclosure (D) To Director Ship Material Serial 001500.

SECRET

UNDERWATER ORDNANCE EQUIPMENT EXPOSED TO TEST (Continued)

TORPEDO Mark 27

<u>SHIP</u>	<u>DISTANCE</u> "A"	<u>DISTANCE</u> "B"	<u>NO.</u>	<u>LOCATION</u>
U.S.S. SKIPJACK (SS-184)	1200 Yds.	1000 Yds.	1	PIU Cradle (fwd)
U.S.S. TUNA (SS-203)	2200 Yds.	1700 Yds.	1	PIU Cradle (fwd)
U.S.S. SKATE (SS-305)	400 Yds.	800 Yds.	1	PIU Cradle (fwd)
U.S.S. APOGON (SS-308)	1000 Yds.	600 Yds.	1	* PIU Cradle (fwd)
U.S.S. DENTUDA (SS-335)	2100 Yds.	1200 Yds.	1	PIU Cradle (fwd)
U.S.S. PARCHE (SS-384)	1200 Yds.	1400 Yds.	1	PIU Cradle (fwd)
U.S.S. PILOTFISH (SS-386)	2400 Yds.	300 Yds.	1	PIU Cradle (fwd)
U.S.S. RALPH TALBOT (DD-390)	1200 Yds.	1800 Yds.	1	Port Deck Aft.
U.S.S. RHIND (DD-404)	1000 Yds.	2200 Yds.	1	Port Deck Aft.
U.S.S. WILSON (DD-408)	1600 Yds.	1400 Yds.	1	Port Deck Aft.
U.S.S. MUGGORD (DD-389)	2900 Yds.	2500 Yds.	1	Port Deck Aft.
U.S.S. CONYNGHAM (DD-371)	2100 Yds.	3500 Yds.	1	Port Deck Aft.
U.S.S. MAYRANT (DD-402)	3600 Yds.	800 Yds.	1	Port Deck Aft.
U.S.S. LAMSON (DD-367)	900 Yds.	- - - -	1	Port Deck Aft.

* One also secured to deck for Test "B".

TORPEDOES Mark 13, Mod. 1

U.S.S. SARATOGA (CV3)	2700 Yds.	500 Yds.	3	(1)(TBM 69094, on flight deck.) (1)(Torpedo Truck hangar deck.) (1)(Normal stowage, Mezzanine deck above hangar deck.)
U.S.S. INDEPENDENCE (CVL22)	700 Yds.	- - - -	3	(1)(TBM 69239 on flight deck.) (1)(Stbd ready rack hangar deck.) (1)(Normal stowage compt. C-101-B.)
U.S.S. NEW YORK (BB-34)	- - - -	1200 Yds.	2	(1)(Stbd main deck Fr. 75.) (1)(Port superstructure, Fr. 56.)

TORPEDO Mark 28

U.S.S. SKIPJACK (SS-184)	1200 Yds.	1000 Yds.	2	(1)(Stbd IU Cradle (fwd)) (1)(PL Cradle (aft))
U.S.S. TUNA (SS-203)	2200 Yds.	1700 Yds.	2	(1)(Stbd IU Cradle (aft))

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SECRET

UNDERWATER ORDNANCE EQUIPMENT EXPOSED TO TEST (Continued)

TORPEDO Mark 28 (Continued)

<u>SHIP</u>	<u>DISTANCE</u> <u>"A"</u>	<u>DISTANCE</u> <u>"B"</u>	<u>NO.</u>	<u>LOCATION</u>
U.S.S. SKATE (SS-305)	400 Yds.	800 Yds.	2	(1) (Stbd IU cradle fwd) (1) (PL cradle aft.)
U.S.S. APOGON (SS-308)	1000 Yds.	600 Yds.	2	(1) (Stbd IU cradle fwd) (1) (PL cradle aft.)
U.S.S. DENTUDA (SS-335)	2100 Yds.	1200 Yds.	2	(1) (Stbd IU cradle fwd) (1) (PL cradle aft.)
U.S.S. PARCHE (SS-384)	1200 Yds.	1400 Yds.	2	(1) (Stbd IU cradle fwd) (1) (PL cradle aft.)
U.S.S. PILOTFISH (SS-386)	2400 Yds.	300 Yds.	2	(1) (Stbd IU cradle fwd) (1) (PL cradle aft.)

TORPEDOES Mark 16, Mod. 1 and 3

U.S.S. APOGON (SS-308)	1000 Yds.	600 Yds.	2	(1) (#3 torpedo tube.) (1) (Upper stbd cradle aft.)
U.S.S. SKIPJACK (SS-184)	1200 Yds.	1000 Yds.	2	(1) (Stbd inboard lower cradle fwd) (1) (#8 torpedo tube.)
U.S.S. PILOTFISH (SS-386)	2400 Yds.	300 Yds.	2	(1) (Upper stbd cradle aft.) (1) (#3 torpedo tube.)
U.S.S. PARCHE (SS-384)	1200 Yds.	1400 Yds.	2	(1) (Upper stbd cradle aft.) (1) (#3 torpedo tube.)
U.S.S. DENTUDA (SS-335)	2100 Yds.	1200 Yds.	2	(1) (Stbd inboard lower cradle fwd) (1) (#10 torpedo tube.)
U.S.S. TUNA (SS-203)	2200 Yds.	1700 Yds.	2	(1) (Stbd inboard lower cradle fwd) (1) (#10 torpedo tube.)

MINE Mark 24

U.S.S. FARATOGA (CVZ)	2700 Yds.	500 Yds.	3	(1) (TBM, flight deck.) (1) (Hangar deck in truck) (1) (Normal stowage compt. A-617-M.)
U.S.S. INDEPENDENCE (CVL22)	700 Yds.	- - - - -	3	(1) (TBM, flight deck.) (1) (Hangar deck in ready rack.) (1) (normal stowage compt. C-101-B.)

SECRET

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S E C R E T

UNDERWATER ORDNANCE EQUIPMENT EXPOSED TO TEST (Continued)

MINE Mark 24 (Continued)

<u>SHIP</u>	<u>DISTANCE</u> <u>"A"</u>	<u>DISTANCE</u> <u>"B"</u>	<u>NO.</u>	<u>LOCATION</u>
U.S.S. NEW YORK (BB-34)	- - - - -	1200 Yds.	2	(1) (Stbd main deck, fr. 75.) (1) (Port superstructure deck, fr. 55.)

ABOVE WATER TORPEDO TUBE LOADING PLAN

<u>SHIP</u>	<u>NO. TUBES</u>	<u>*NO. SERVICE</u> <u>TORPEDOES.</u>	<u>**NO. SPECIAL</u> <u>TEST "A"</u>	<u>TORPEDOES</u> <u>TEST "B"</u>
LAMSON (DD-367)	1	2	2	0
CONYNGHAM (DD-371)	3	6	2	0
MUGFORD (DD-389)	4	2	2	0
TALBOT (DD-390)	4	2	2	2
RHIND (DD-404)	3	4	2	2
WILSON (DD-408)	2	4	2	0
MAYRANT (DD-402)	2	4	0	2
TRIPPLE (DD-403)	2	1	0	2
STACK (DD-406)	2	8		
HUGHES (DD-410)	2	5		
ANDERSON (DD-411)	2	8		
WAINWRIGHT (DD-416)	2	4		

* "Service Mark 15 ready for war shot.

** "Special" Mark 15, Mod. 3.
Exploder Mark 6, Mod. 6.
Detonator Mark 2 (Special).
Boosters Mark 2 - dummy.
Igniters Mark 6, Mod. 2.
Warhead Mark 17, 2 or 3.
Inert-loaded.

S E C R E T

Enclosure (D) to Director Ship Material Serial 001500.

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Distance
A B
800 yds. 700 yds.

Torpedo Loading List (Destroyers)

U.S.S. HUGHES

D.D. #410

ENCLOSURE (D) to Director Ship Material Serial 001500.

Torpedo	Reg. No.	Mark	Mod.	Warhead		Mk. No.	Explosive	Mk. No.	Det.		Booster		Igniter		Load	Data	Type	Test	
				Reg. No.	Mk. No.	Reg. No.	Reg. No.	Mk. No.	Mk. Mod.	Mk. Mod.	Mk. Mod.	Mk. Mod.	Mk. Mod.	Mk. Mod.				A	B
15652		15 1		299	15 2		2438						6	2	2	R	Service	X	X
15671		15 1		83	15 2		3250						6	2	2	L	"	X	X
15656		15 1		3300	15 2		3295						6	2	1	L.C.	"	X	X
15633		15 1		3730	15 2		2401						6	2	1	R.C.	"	X	X
15630		15 1		3121	15 2		3215						6	2	1	L	"	X	X

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Distance	
A	B
3600 yds.	800 yds.

Torpedo Loading List (Destroyers)

U.S.S. MAYRANT

D.D. #402

Torpedo Reg. No.	Mk	Mk	Warheads Reg. No.	Mk	Mk	Explosive Reg. No.	Mk	Mk	Det.		Booster		Igniter		Load Tube	Data Barrel	Type Load	Test	
									Mk	Mod	Mk	Mod	Mk	Mod				A	B
14806	15 1	15 2	556	15 2	15 4	785	5 4						6	2	1	R	Service	X	X
13986	15 2	15 2	3729	15 2	5 4	3883	5 4						6	2	1	L	"	X	X
14916	15 2	15 2	3132	15 2	5 4	1987	5 4						6	2	2	R.C.	"	X	X
15301	15 1	15 2	3294	15 2	5 4	1353	5 4						6	2	2	L.C.	"	X	X
38723	15 3	17 3	12196	17 3	6 6	28112	6 6		9	2	2		6	2	R	R	Special	-	X
76544	15 3	17 3	12115	17 3	6 6	11296	6 6		9	2	2		6	2	2	L	"	-	X

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Enclosure (D) to Director Ship Material Serial 001500.

Distance
A B
600 yds.

Torpedo Loading List (Destroyers)

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ENCLOSURE (D) to Director Ship Material Serial 001500.

U.S.S. ANDERSON

D.D. "411"

Torpedoes	Reg. No.	Mark	No.	Warhead	Reg. No.	Explosive	Mark	No.	Det.	Mod	Mk	Booster	Mod	Mk	Igniter	Mod	Tube	Data	Type	Test	
																				A	B
	15444	15	1	2574	15	2	1558	5	4						6	2	2	L.C.	Service	X	
	15405	15	1	2516	15	2	1886	5	4						6	2	2	L	"	X	
	15413	15	1	3620	15	2	1597	5	4						6	2	1	R.C.	"	X	
	15372	15	1	2578	15	2	1562								6	2	1	R	"	X	
	15750	15	1	441	15	2	1889	5	4						6	2	1	L.C.	"	X	
	15263	15	1	3008	15	2	2157	5	4						6	2	1	L	"	X	
	13849	15	2	3858	15	2	2169	5	4						6	2	2	R	"	X	
	13838	15	2	1411	15	2	799	5	4						6	2	2	R.C.	"	X	

Distance
A B
3100 yds. 3500 yds.

SECRET

Torpedo Loading List (Destroyers)

U.S.S. CONYNGHAM

D.D. "371"

Torpedoes Reg. No.	Mark	No.	Warhead		Mark	No.	Explosive Reg. No.	Mark	No.	Det.		Booster			Igniter		Load	Data	Type	Test	
			Mk	Mod						Mk	Mod	Mk	Mod	Mk	Mod	Mk				Mod	Barrel
15516	15 1		3734		15 2		1557		5 4						6	2	2	R.C.	Service	X	X
15421	15 1		2042		15 2		3261		5 4						6	2	2	L.C.	"	X	X
15739	15 1		690		15 2		2150		5 4						6	2	2	L	"	X	X
15662	15 1		2347		15 2		3255		5 4						6	2	3	R	"	X	X
15247	15 1		2046		15 2		2259		5 4						6	2	3	R.C.	"	X	X
13596	15 2		1413		15 2		1599		5 4						6	2	3	L.C.	"	X	X
77852	15 3		11963		17 2		23570		6 6						6	2	1	R	Special	X	X
77520	15 3		12247		17 2		27975		6 6						6	2	1	L	"	X	X

Enclosure (D) to Director Ship Material Serial 001500.

SECRET

Distance

A	B
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1000 yds. 2200 yds.

Torpedo Loading List (Destroyers)

U.S.S. RHIND

D.D. "404"

ENCLOSURE (D) to Director Ship Material Serial 661500.

Torpedoes	Reg. No.	Mark	No.	Warhead		Mark	No.	Exploders	Mark	No.	Det.	Booster			Igniters			Load	Data	Type	Test	
				Reg. No.								Lk	Mod	Mk	Mod	Mk	Mod				Barrel	Load
	13810	15 2		2380		15 2		1527	5 4					6	2		1	L.C.	Service	X	X	
	13333	15 0		872		15 2		1308	5 4					6	2		1	L	"	X	X	
	13510	15 2		1699		15 2		1602	5 4					6	2		1	R.C.	"	X	X	
	3504	15 2		1720		15 2		800	5 4					6	2		1	R	"	X	X	
	77842	15 3		11886		17 3		27859	6 6			9	2	2	0	6	2	2	R	Special	X	
	77234	15 3		12157		17 3		31313	6 6			9	2	2	0	6	2	2	L	"	X	
	38430	15 3		11886		17 3		27840	6 6			9	2	2	0	6	2	2	L	"		X
	76088	15 3		12157		17 3		27377	6 6			9	2	2	0	6	2	2	R	"		X

Distance
A B
 2900 yds. 2500 yds.

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Torpedo Loading List (Destroyers)

D.D. "389"

U.S.S. MUGFORD

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Torpedoes	Reg. No.	Mod	Mark	Warhead	Reg. No.	Mod	Mark	Exp. No.	Mod	Mark	Det.		Booster		Igniter		Load	Data	Type	Test	
											Mk	Mod	Mk	Mod	Mk	Mod				A	B
12753	15 2	15 2	15 2	1698	15 2	15 2	15 2	9534	5 0	5 0					6	2	2	R.C.	Service	X	X
12752	15 2	15 2	15 2	1718	15 2	15 2	15 2	17869	5 0	5 0					6	2	2	L.C.	"	X	X
38960	15 3	15 3	17 2	11922	17 2	17 2	17 2	22854	6 6	6 6	2	2	2	0	6	2	3	L	Special	X	X
76545	15 3	15 3	17 2	12103	17 2	17 2	17 2	14250	6 6	6 6	2	2	2	0	6	2	3	R	"	X	X

S E C R E T
Enclosure (

U.S.S. LAMSON

D.D. N 367M

Torpedo Loading List (Destroyers)

Distance

400 yds.

[illegible]

SECRET

Distance

A	B
1200 yds.	1800 yds.

Torpedo Loading List (Destroyers)

D.D. "390"

U.S.S. RALPH TALBOT

Torpedoes Reg. No.	Mod Mark	Warhead Reg. No.	Mod Mark	Exploder Reg. No.	Mod Mark	Det.			Booster			Igniter			Load Tube	Data Barrel	Type Load	Test	
						Mk	Mod	Mk	Mk	Mod	Mk	Mk	Mod	Mk				A	B
76865	15 3	11761	17 3	3754	6 6	9	2	2	2	0	6	2	2	3	R	Special	X		
76861	15 3	12019	17 3	28095	6 6	9	2	2	2	0	6	2	2	3	L	"	X		
38603	15 3	11761	17 3	16071	6 6	9	2	2	2	0	6	2	2	3	R	"	X		
38604	15 3	12019	17 3	27468	6 6	9	2	2	2	0	6	2	2	3	L	"	X		
15692	15 1	1851	15 2	801	5 4						6	2	2	2	R.C.	Service	X	X	
15376	15 1	2379	15 2	1890	5 4						6	2	2	2	L.C.	"	X	X	

ENCLOSURE (D)

to Director Ship Material Serial 001500.

Distance
A B
2200 yds. 2800 yds.

SECRET

Torpedo Loading List (Destroyers)

D.D. #419*

U.S.S. WAINWRIGHT

SECRET
 Enclosure (D)

Torpedoes	Reg. No.	Mod	Mark	Warhead		Mod	Exploders		Mark	Mod	Mk	Det.			Booster			Igniters			Data	Type	Test	
				Reg. No.	Mod		Mk	Mod				Mk	Mod	Mk	Mod	Mk	Mod	Mk	Mod	Mk			Mod	Mk
	13499	15	2		1409	15	2	1528	5	4								6	2	1	L	Service	X	X
	12751	15	2		3780	15	2	1508	5	4								6	2	2	L.C.	"	X	X
	13244	15	2		2771	15	2	1556	5	4								6	2	1	R	"	X	X
	12774	15	2		2168	15	2		5	4								6	2	2	R.C.	"	X	X
																	</							

to Director Ship Material Serial 001500.

SECRET

Distance
A B
1000 yds.

Torpedo Loading List (Destroyers)

U.S.S. TRIPPE

D.D. "403"

Torpedoes Reg. No.	Mod Mark	Warhead Reg. No.	Mod Mark	Explosive Reg. No.	Mark	Mod	Det.		Booster		Igniter		Load Tube	Data Barrel	Type Load	Test	
							Mk	Mod	Mk	Mod	Mk	Mod				A	B
13587	15 2	208	15 2	830	5	4					6	2	1	1	Service	X	X
76104	15 3	11918	17 3	13819	6	6	9	2	2	0	6	2	2	R. C.	Special	-	X
38747	15 3	11728	17 3	27865	6	6	9	2	2	0	6	2	2	L. C.	Special	-	X

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SECRET

Distance
A B
 1200 yds. 1800 yds.

Torpedo Loading List (Destroyers)

U.S.S. STACK

D.D. "406"

Torpedoes	Reg. No.	Mod	Warhead		Exp. Wt.	M. Q.	Exploder		Mark	M. Q.	Det		Booster		Igniter		Load	Data		Type	Test	
			Reg. No.	Mod			Reg. No.	Mk			Mod	Mk	Mod	Mk	Mod	Barrel		Load	A		B	
15198		15	1	2045	15	2		2184	5	4					6	2	1	L	Service	X	X	
15299		15	1	3302	15	2		10566	5	4					6	2	2	R.C.	"	X	X	
15313		15	1	676	15	2		1600	5	4					6	2	1	R.C.	"	X	X	
15328		15	1	2331	15	2		1593	5	4					6	2	1	R	"	X	X	
15436		15	1	3087	15	2		929	5	4					6	2	2	R	"	X	X	
15478		15	1	3859	15	2		1504	5	4					6	2	2	L.C.	"	X	X	
15719		15	1	2083	15	2		63	5	4					6	2	2	L	"	X	X	
15720		15	1	3776	15	2		3299	5	4					6	2	1	L.C.	"	X	X	

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S E C R E T

Mine Mark 6

TEST "A"

An inspection after Test "A" revealed that the floats on all the mines were resting loosely on the case. All of these floats, however, were secure enough so that they would not fall free and the mine undoubtedly could have been launched in a satisfactory manner. The case of the mine on the NAGATO was slightly loosened from the anchor but not enough to effect proper operation.

In all mines a large amount of water was found in the case, probably from sweating, which lowered the resistance of the electrical wiring by grounding, but not to a degree to reject the mine. The mines were given a thorough check, dried and left for Test "B".

Depth Charge Mark 14.

The battery and A-4 mechanisms were checked prior to and after Test "A". No changes were found.

Depth Charges Mark 9.

A check was made on all charges. After the test, no damage was noted and pistols and extenders remained in normal condition. It was particularly noteworthy that the original coat of paint on these charges held up well in comparison with paint on the surrounding area and with paint that had been used on these charges to obliterate some of the markings.

Depth Charge Mark 8.

A check was made both before and after Test "A", and the charges were found to be in good condition, including the batteries. No change was noted after the test.

Depth Charge Mark 6.

The hydrostatic settings and charges in general were found in good condition after Test "A" with no damage sustained.

Torpedoes Mark 16. Mod. 1 and 3

Preparation:

Twelve torpedoes, Mark 16, Mod. 1 and two (2) Mark 16, Mod. 3, were tested in Test "A". These torpedoes were assembled with special inert-loaded Warheads Mark 16 and similarly loaded Warhead Extensions Mark 5.

Eight of the fourteen torpedoes had installed an Exploder Mechanism Mark 6, Mod. 5 with a Detonator Mark 9 and no booster. The remaining six torpedoes had installed an Exploder Mechanism Mark 10, Mod. 3, containing a Detonator Mark 7, Mod. 2. All exploders were set on safe.

S E C R E T

Enclosure (D) to Director Ship Material Serial 001500.

S E C R E T

TEST "A" (Continued)

Torpedoes Mark 16, Mod. 1 and 3 - (Continued)

Preparation: (Continued)

The ignitor air lead connection was not connected to the Mark 15 ignitor. This air lead connection was securely capped to prevent entrance of pressure from any source. In the Torpedoes Mark 16, Mod. 3, the fuel compartments were charged with fresh water containing 1/2% florescein dye (red) and the Navol tanks were charged with glycerin containing 1/2% florescein dye (green). In the Torpedoes Mark 16, Mod. 1, uncolored water was charged in the fuel compartment and water with 1/2% fuschin dye (simulating fuel) was put in the liquid catalyst compartment. The Navol tanks were charged with 1/2% florescein dye as in the Mark 16, Mod. 3.

The air flasks were charged to 600 psi and stop valves were opened 1/4 to 1/2 turn. The torpedoes were in all other respects ready for a war shot. The exploders of these torpedoes were fully tested before Test "A" to assure that they were fully operative.

Torpedo Loading:

One Torpedo Mark 16 was loaded in each torpedo room of the seven submarines carrying special torpedo test material. One Torpedo Mark 16 was carried in normal stowage and the other loaded in a torpedo tube and then placed in the submarines in such a manner that if the forward torpedo room of a certain submarine carried a Torpedo Mark 16 in a tube then the next submarine carried it in the forward normal stowage. This procedure also applied to the after torpedo room. All torpedo tubes were dry except #10 tube in the U.S.S. DENTUDA (SS-335). The muzzle door of this tube was left open during the test and a Torpedo Mark 16 was loaded in this tube.

Inspection after Test "A":

After Test "A", a visual inspection was made of these torpedoes and no damage was discovered and for this reason only three torpedoes were removed and given a shop analysis. All other torpedoes were checked on board each target submarine and they were found to be undamaged, and in good mechanical adjustment. The three torpedoes which were removed were given a thorough shop analysis and were found to be in a good condition and operable. None of the detonators or ignitors were fired.

The torpedoes which were left on board the target submarines were again used for Test "B". The six Exploder Mechanisms Mark 10, Mod. 3 were removed and shipped to the Naval Ordnance Laboratory for examination.

TORPEDO, Mark 13, Mod. 1.

Three special test torpedoes, Mark 13, Mod. 1 were displayed in each carrier, the U.S.S. SARATOGA, (CV3) and the U.S.S. INDEPENDENCE, (CVL22).

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S E C R E T

TEST "A" (Continued)

TORPEDO, Mark 13, Mod. 1 - (Continued)

One torpedo was loaded on a plane on the flight deck, one on a torpedo truck on the hangar deck and one in the normal stowage of each carrier.

Each Torpedo, Mark 13, Mod. 1, was assembled with a special inert-loaded Warhead, Mark 13, Mod. 4 and an Exploder Mechanism, Mark 9, Mod. 1, using a Detonator, Mark 8, Mod. 2, but without a booster. The Exploder Mechanism was cocked but unarmed. An ignitor, Mark 6, Mod. 3, was used without having the airlead connected. The ignitor air lead was securely capped to prevent any pressure reaching the ignitor so that any damage to the ignitor would be caused by the direct effects of heat from the bomb blast. The full tanks were charged with fresh water colored with sea marker dye so that any leaks or carry overs could be easily detected. The stop valves were opened 1/4 to 1/2 a turn. The torpedoes that were carried in planes were not with air charged, but the torpedoes, in all other respects, were made ready for a war shot.

The special test Torpedoes, Mark 13, Mod. 1, displayed on the U.S.S. SARATOGA, (CV3), were inspected after Test "A" and were found in the same location originally displayed with no visible damage sustained. These three torpedoes were removed for shop analysis.

The special test torpedoes, displayed on a TBM on the flight deck of the U.S.S. INDEPENDENCE, (CVL22), was found on the flight deck less the Warhead. The plane and Warhead were apparently blown overboard. The torpedo located on the hangar deck was found in its original position and slightly scorched. The torpedo located in normal stowage was destroyed by fire. The torpedoes located on the flight deck and hangar deck were removed for shop analysis.

The special test torpedoes, Mark 13, Mod. 1, removed from the U.S.S. SARATOGA (CV3), were given a shop analysis and found in good mechanical adjustment. The ignitors and detonators had not fired.

The special test torpedo removed from the flight deck of the U.S.S. INDEPENDENCE, (CVL22), was given a shop analysis and it was found that the air-flask had not suffered any damage. The afterbody had a dent 1/2 inch deep located approximately 6" from the forward joint and 90 degrees from top center measured counter clockwise. On the tail the upper vertical rudder was broken and both propellers slightly bent. Other features were in good mechanical condition and the ignitor had not fired.

The special test torpedo, Mark 13, Mod. 1, removed from the hangar deck of the U.S.S. INDEPENDENCE, (CVL22), was given a shop analysis and other than being slightly scorched it was in good condition. The detonator and ignitor had not fired.

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TEST "A" (Continued)

TORPEDO Mark 28

Fourteen Torpedoes, Mark 28 were used in Test "A". Each torpedo was assembled with a special inert-loaded Warhead and an Exploder Mechanism, Mark 14 having a live detonator. The Exploder mechanism was unarmed and without booster. The batteries were left dry to eliminate the ventilation problem that would arise upon closing of the ships for Test "A". The torpedoes were in all other respects ready for a war shot. One Torpedo Mark 28 was carried in the normal stowage torpedo cradles of each torpedo room of the seven submarines carrying special torpedo test material.

AFTER TEST "A"

All these units were given a visual inspection and no damage was discovered. Inasmuch as there was no visible damage only one unit from the USS PARCHE (SS-394), U.S.S. PILOTWISH (SS-386) and two from the U.S.S. SKATE (SS-305) were removed for shop analysis.

The four units removed from the target submarines after Test "A" were given an electronics test, afterbody and tail cone test, tickle test and deck run. All performed in a satisfactory manner. The detonator had not fired. The lead stowage batteries were not damaged but all the X469 "B" pack voltages with the exception of one were low. The Nord 5220 which was removed from the SIU cradle of the forward torpedo room of the U.S.S. PARCHE (SS-394) showed, upon further examination, that the diaphragm had deteriorated. This depth unit had previously been used for experimental runs, and as the records submitted previous to Test "A" do not show that the depth unit had been checked, the defective diaphragm should not necessarily be attributed to Test "A".

The Nord 5220 which was located in the UP cradle in the after torpedo room of the U.S.S. SKATE (SS-305) had a slight dent in the battery compartment. This dent appeared to have been made by rotating with a sluing bar. The unit was ring gauged and found satisfactory.

TORPEDOES Mark 18, Mod. 2.

There were fourteen (14) torpedoes, Mark 18, Mod. 2 used in Test "A". Nine (9) of these torpedoes were assembled with a special inert-loaded Warhead, Mark 18, Mod. 4 (EBL-loaded). The torpedoes carrying live loaded Warheads were loaded in submarines carrying a full allowance of ammunition. Exploder mechanisms, Mark 8, Mod. 7 with Detonators Mark 8, Mod. 2 less boosters were used in the warheads. The electrolyte was left out of the batteries to eliminate the ventilating problem that would arise while the submarines were closed for the test.

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AFTER TEST "A" (Continued)

TORPEDOES, Mark 18, Mod. 2 -(Continued)

The torpedoes were made ready for war shots in all other respects. Torpedo tube rollers were removed from the #3 tube on the U.S.S. DENTUDA (SS-335) and the #10 tube on the U.S.S. FARCHIE, (SS-384) in which Torpedoes Mark 18 were loaded in order to determine what damage, if any, would be caused by rollers on thin walled torpedo battery compartments.

After Test "A", all Torpedoes, Mark 18, Mod. 2 were visually inspected and no damage was discovered. For this reason, only 4 torpedoes were removed and given a shop analysis. The remaining 8 were checked on board target submarines.

The torpedoes, which were on board target submarines were found in good electrical and mechanical adjustment. The following damage was noted in torpedoes given a shop analysis: Torpedo, Mark 18, Mod. 2, #58148, located in the after starboard inboard lower cradle on board the U.S.S. SKATE (SS-305), was found with a large dent on the starboard side of the battery compartment. This was caused by the securing band of the adjacent torpedo, which carried away during the bomb blast and struck this battery compartment. The battery compartment was ring gauged and found satisfactory.

The number ten torpedo tube in the U.S.S. SKATE (SS-305) containing Torpedo, Mark 18, Mod. 2, #99870 was flooded and the torpedo remained in the flooded tube for several days. The torpedo interior was found free of seawater, but very damp. The electric motor was found to have a zero ground. After drying the motor for several hours, the ground was again checked and the motor found satisfactory. The remaining two torpedoes were found to be in good electrical and mechanical adjustment. The torpedoes were ring gauged and found to be satisfactory. No torpedoes were lost during the test, no detonators had fired and the battery compartments had not been damaged by the rollers.

TORPEDO Mark 33

Two Torpedoes, Mark 33 were supplied by the Bureau of Ordnance for test of the structural strength of the outer shell (which is aluminum). There was no adjustments, overhaul or shop analysis required. These Nords were physically examined before and after Test "A" for evidence of structural damage.

Results of After Test "A" Examination:

The Torpedoes Mark 33 on board the U.S.S. APOGON (SS-308) and the U.S.S. SKIPJACK (SS-184) were inspected after Test "A" and no structural damage was found. These units were left on board for Test "B".

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AFTER TEST "A" (Continued)

MINES Mark 24

Six mines Mark 24 were used in Test "A". These mines Mark 24 were assembled with an inert-loaded Warhead containing a C-2 fuze with detonator. The batteries were left dry so as to eliminate the ventilation problem that would arise if electrolyte were added. The Mines Mark 24 were thoroughly checked and were ready for a war shot in all other respects. Three Mines Mark 24 were loaded on each carrier, the U.S.S. SARATOGA (CV3) and the U.S.S. INDEPENDENCE (CVL22). One mine Mark 24 was placed in an airplane, (TBM), on the flight deck of each carrier, one on a truck or in ready rack on hangar deck and one in normal stowage of each carrier.

Results of Test "A":

The units that were located on board the U.S.S. SARATOGA (CV3), were inspected after Test "A" and no damage was found. The C-2 fuze had not detonated. The unit that was located in the TBM on the flight deck was removed for shop analysis.

The unit that was located in normal stowage, compartment C-101-B, had been subjected to extreme heat. The shell was intact but the C-2 fuze was missing and the condition of the head indicated it had detonated and blown free from the head. The head and tail section were removed for shop analysis. Upon examination in shop it was found that all that remained inside was charcoal, disintegrated plaster and melted metal. In most instances the parts were not recognizable. This unit was jettisoned.

The unit that was located in the ready rack on the hangar deck had suffered severe physical damage, due to flying missiles and slight heat. This unit was removed for a shop analysis.

The unit that was removed from the plane on the flight deck of the U.S.S. SARATOGA (CV3), showed no physical damage upon examination in shop. This unit performed normally when given an electronic check, tickle test and a check run. The voltage of the X469 batteries were low, however, since these "B" packs had been in stowage for over a year. The low voltages could be accounted for even though these packs were within the prescribed limits when installed.

The unit which was removed from the ready rack on the hangar deck of the U.S.S. INDEPENDENCE (CVL22), was given a shop analysis and considerable damage was found. This unit was damaged severely from flying missiles and was not in condition to cycle although the main motor suffered no damage and functioned normally. The fastening studs on the port side of the nose section were stripped causing the head to pull away from cylinder about 1/4". The C-2 fuze had suffered no damage except there was evidence of the plastic window starting to melt due to the heat to which it had been subjected during the fire.

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AFTER TEST "A" (Continued)

MINES Mark 24 - (Continued)

On the cylinder section a large concave dent was found on the port side forward. This dent was about 17" in length, 12" in width and the forward part was approximately 3" abaft the forward cylinder bulkhead. The center of the dent was approximately 6" abaft the control panel and slightly above the port hydrophone. This dent caused the forward cylinder edge to out of round, but did not affect the security of the gasket. The port side of the control panel was bent as well as the mounting studs. Another dent was found on the underside of the cylinder approximately 24" abaft the cylinder's forward edge. This dent was 12" by 6" and actually punctured the cylinder, thus wedging the battery in the rack so that it was difficult to remove. However, the battery was not damaged, even though the battery securing bar was bent and the mounting studs were pulled out of shape.

The control panel was removed and was found to be distorted. The edge of the panel by the V-18 tube was bent and the oscillator tube smashed. The mounting studs which hold the panel in position were bent and in some cases the threads were stripped. The hydrophones appeared to be undamaged with the exception of the coaxial lead to J-2 which was severed.

On the tail section the stud shaft wings and elevator and the rudder vanes were bent. One blade of the propellor was dented. The upper rudder stud shaft taper pin had sheared while the lower rudder assembly was undamaged and would operate the steering motor. The reduction gears of the elevator steering motor were stripped but the connecting rod and yoke assembly were intact.

A leak was noted around the pipe fitting to the depth bellows, but the depth unit itself was unharmed. This leak could possibly have been caused by a shallow dent which was found on the starboard side just below the depth control unit.

TORPEDO Mark 27

The torpedoes Mark 27 were assembled with a special inert-loaded Warhead containing an Exploder Mechanism Mark 11 (set safe) with a live detonator.

The batteries were left dry to eliminate the ventilation problem that would evolve when the ships were closed for Test "A". The torpedoes Mark 27 were ready for a war shot in all other respects. One Torpedo Mark 27 was placed in the port inboard upper cradle (forward torpedo room) of the seven submarines carrying special test material and one Torpedo Mark 27 was placed in a cradle which was secured to the port after deck of seven target destroyers.

A visual shipboard inspection was made after Test "A" of all units placed on the target submarines and destroyers with the exception of the unit on the U.S.S. LAMSON (DD-367) which was lost with the vessel.

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AFTER TEST "A" (Continued)

TORPEDO Mark 27 - (Continued)

The units showed no evidence of damage and none of the detonators in the Exploder Mechanisms Mark 11 had fired. For this reason it was decided to remove two representative units from submarines and two from destroyers for a shop analysis. The units removed were from the U.S.S. TUNA (SS-203), U.S.S. SKATE (SS-305), U.S.S. RHIND (DD-404) and the U.S.S. WILSON (DD-408).

The four units removed from target submarines and destroyers were given a thorough shop analysis, electronic tests, tickle tests and check run and all reacted normally. The lead storage batteries were undamaged but the batteries X469, B pack voltages were low. Units removed from the U.S.S. RHIND (DD-404) and the U.S.S. WILSON (DD-408) showed external evidence of heat and scorching.

TEST "A"

Attention is invited to the facts that in Test "A" when two destroyers were sunk, the Torpedoes Mark 15 from both vessels were located on the bottom of the lagoon and it is evident that the guide stud holding screws had sheared off permitting the torpedo to move to the rear of the barrel until the torpedo tube door causing severe damage to the propellers.

In the case of the U.S.S. RHIND (DD-404) in Test "A" only those torpedoes in the starboard tube, which was trained out abeam (090 Degrees) moved ahead in their barrels due to the fact the torpedo stop tension links of all four barrels had been broken and it is believed this occurred when the ship "snap-rolled" violently immediately after the bombs detonation and the torpedoes rode up hard against the forward torpedo stop carrying away the links.

No material damage was sustained by any of the other destroyers in the target vessel group during Test "A".

TORPEDOES Mark 15, Mod. 3.

Complete inspections were made of all Destroyers in Target Group and the following conditions were noted:

U.S.S. RHIND (DD-404) whose position was 1000 yards from center of target received considerable structural damage by bomb blast. Bulkheads, bulwarks and superstructure adjacent to starboard torpedo battery were severely damaged but no material damage to the torpedo tubes occurred.

All four (4) torpedo stop tension links of the starboard torpedo tubes were broken, permitting torpedoes to slide part way out of the barrels for a distance of approximately five (5) feet where they became wedged and remained so until hauled back to normal loading position.

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AFTER TEST "A" (Continued)

TORPEDGES Mark 15. Mod. 3 - (Continued)

The breaking of the torpedo stop tension links could have occurred when the ship took a quick violent roll to starboard, throwing the full weight of the torpedo against the front stop. It was evident that the torpedoes did not receive sufficient forward motion to actuate the inertia starter completely. All torpedoes were in full ready condition and starting levers had been forced to the rear by the tube tripping latches, however, the inertia weight remained suspended and starting piston remained seated. The starboard service torpedoes, was trained out to 090 Degrees and secured in that position for Test "A". It was evident that the starboard side of the ship took the full blast of the bomb in many respects and all paint surfaces showed definite signs of residue deposits along all leading edges. This residue resembled burned paint in many respects.

The port torpedo battery carrying two (2) special test torpedoes in the wing barrels was secured at 180 degrees and was shielded from the blast by the deck houses and starboard torpedo battery with the exception of an area approximately 42" x 50" on the inboard side of the left barrel, just above the saddle and extending aft toward the tube spoon. This area was directly in line with a passageway on starboard side of main deck, between deck after bulkhead and the breach of starboard torpedo tubes, and was unobstructed, permitting a clear sweep of the blast wave to reach the port torpedo tube, leaving a deposit of residue in its wake.

All instruments, both port and starboard were tested and operated satisfactory. Both torpedo batteries were trained in hand and power drive. All electric wiring and hydraulic tubing remained intact and serviceable.

All torpedoes were checked and found in excellent condition. The two (2) special test torpedoes which were in the port tubes were removed and given an analytic overhaul. No apparent damage was noted. The air flask was given a routine hydraulic test and passed in every respect.

The Mark 7 detonator stowage box, under the bridge, starboard side, frame 62 which was subjected to, what appeared as terrific heat was found to be in excellent condition. These were sent to Naval Torpedo Station, Newport, R.I., for routine test. The whole area in the immediate vicinity of the detonator stowage was subjected to the full force of the blast causing bulkheads to be dished and distorted to the extent that whole plates were ripped apart. Door frames were completely torn from the adjacent bulkheads and twisted in such a manner that it was impossible to close the doors. The plate on the inboard bulkhead at frame 63 was torn completely loose and forced inward for a distance of about 3 feet, yet, with all this, the detonators, stowed in this area did not explode.

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AFTER TEST "A" (Continued)

TORPEDOES Mark 15, Mod. 3 - (Continued)

The Mark 9 detonator stowage was also subjected to about the same forces and they too withstood it in every respect.

Both Mark 7 and 9 detonators and boxes when removed from stowages showed no visible damage, despite the fact that the surrounding area appeared to have been subjected to terrific heat and blast pressures.

The Mark 2 booster charged, stowed in compartment 0311 1/2 were checked and showed no physical change in any respect. The powder (S.N.B.P.) stowage was found intact.

The U.S.S. RALPH TALBOT (DD-390), U.S.S. STACK (DD-406), U.S.S. WILSON (DD-408), U.S.S. HUGHES (DD-410), and U.S.S. WAINWRIGHT (DD-419) sustained no damage other than deposits of residue on paint surfaces of tubes. The U.S.S. CONYNGHAM (DD-371), U.S.S. MUGFORD (DD-389) U.S.S. MAYRANT (DD-402) and U.S.S. TRIPPE (DD-403) suffered no damage in any respect.

All special test torpedo material was removed and replaced for Test "B" from material carried in the U.S.S. DIXIE (AD-14). Visual and inspections revealed no damage to any torpedoes and therefore sample torpedoes were removed.

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TEST "B"

It was originally planned to replace all special test underwater ordnance material on target vessels with supplies that had been placed on the U.S.S. DIXIE (AD14) and U.S.S. FULTON (AS11) for Test "B".

However, due to the negligible damage obtained in Test "A" and the limitation of time between the two tests it was decided that representative samples only be replaced and the remaining material be retained aboard the target vessels for Test "B". The representative samples removed were taken to the U.S.S. DIXIE (AD14) and the U.S.S. FULTON (AS11) for shop analysis or to be shipped to various shore stations for complete analysis as to damage or derangement.

Due to the large amount of damage to the U.S.S. INDEPENDENCE (CVL22) it was decided not to place any special test underwater ordnance aboard. Space was found on deck of the U.S.S. NEW YORK (BB34) to place two Torpedoes, Mark 13 and Mines, Mark 24, that would have been placed on the U.S.S. INDEPENDENCE, likewise as the U.S.S. LAMSON had been sunk the Torpedo, Mark 27, that was to have been placed on the deck was transferred to the deck of the U.S.S. APOGON which was submerged during Test "A". Other test torpedo material and depth charges were shifted to the U.S.S. TRIPPE.

MINE, Mark 24

The Mines, Mark 24, were located in the same position as for Test "A" on board the U.S.S. SARATOGA (CV3), no Mines, Mark 24, were displayed on the U.S.S. INDEPENDENCE (CVL22) due to the damage sustained in Test "A". Two Mines, Mark 24, were placed on the U.S.S. NEW YORK (BB34) on bomb trucks. One Mine, Mark 24, was displayed on the main deck, starboard side and other on the superstructure deck, port side.

The Mines, Mark 24, displayed on the U.S.S. SARATOGA (CV3) were lost with the ship. The units removed from the U.S.S. NEW YORK (BB34) were given a visual inspection and shop analysis. The hydrogen units were left open during Test "B" and it was thought that water might have entered the units. The tail section was unbuttoned from the cylinder but no water was found. The mines had to be decontaminated before a shop analysis could be made. The units were given a thorough shop analysis and no significant changes were found. Slight changes were found in operating points of micro switches, electronic constants and running depths. These changes should be attributed to personnel error and differences in testing gear rather than to the effects of Test "B". The C-2 fuzes did not detonate. It is considered significant that the hydrophones were not damaged and operated normally in the Mines, Mark 24, whereas the hydrophones in the Torpedo, Mark 27, were damaged. The Mines, Mark 24, were painted white on top and this no doubt reflected part of the heat thereby protecting the hydrophones.

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TORPEDO, Mark 18, Mod. 2

Fifteen Torpedoes, Mark 18, Mod. 2, were used in Test "B", prepared and assembled in the same manner as for Test "A". One additional torpedo with live loaded warhead was used to replace the damaged service allowance warhead from Test "A".

Inspection and shop analysis of all torpedoes divulged no damage that could be attributed directly to the blast. Damage found was due to the torpedoes being without the usual routine care. The #10 torpedo tube containing a Torpedo Mark 18 on board the U.S.S. SKATE (SS-305) had the tube flooded with approximately 4" of salt water for several days. The underside of this torpedo was badly corroded through galvanic action. The torpedo was partly flooded with salt water and the electric motor was found with a zero ground which cleared after the motor had been baked for six hours.

The Torpedo, Mark 18, Mod. 2, located in the upper starboard cradle in the after torpedo room on board the U.S.S. DENTUDA (SS-335) was found to have moisture in the interior of the afterbody. The electric motor was tested for ground and a reading of 1 megohm was found. The motor was then baked for six hours and allowed to cool overnight when a reading of 9 megohms was obtained. The motor was then given a deck run and found satisfactory.

The Battery, Mark 2, Serial 3662, which was removed from the Torpedo, Mark 18, Mod. 3, located in #3 torpedo tube on board the U.S.S. DENTUDA (SS-335) during both tests was given a wet charge and several tests made to determine what damage if any had been sustained by this battery. All tests proved satisfactory. Two cells were removed and carefully inspected for damage or derangement to plates and separators. The plates and separators were found to be in good condition and the only defects noted were slight cracks near the top of the grid on the plates, which is not uncommon and is due to manufacture.

A careful inspection was made of the battery compartments for tube roller damage with negative results. The torpedoes were ring gauged and found satisfactory. No detonators had fired.

DEPTH CHARGES

No damage was sustained by the depth charges.

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TORPEDO, MARK 16, MOD. 3 (Cont'd)

The torpedo, mark 16, mod. 3, which was located in the #10 torpedo tube with muzzle door open on board the U.S.S. DENTUDA (SS 335) had suffered some damage. The after body was found flooded with a mixture of salt water, fresh water with fuschin dye (red) making a rusty greasy looking substance. The Navol, fuel and water compartments were approximately 3/4 full and the air flask pressure had dropped from 600 psi before Test "B" to 300 psi at time of shop analysis.

It is believed that the Navol, fuel and water compartments were blown either by leaky valves or by the valves being unseated due to the bomb blast.

The after body after being drained was tested for leaks with 10 lbs. of internal air pressure. Leaks were found around the hand hole covers and gear train bulkhead. The afterbody was taken apart and placed in a state of preservation, adjustments were not checked nor disturbed. Other than the parts being very rusty no damage could be discovered.

The topside of the warhead was found "dished in" for 31" in length, 6 1/2" in width and approximately 2 3/8" in depth. The exploder cavity was also slightly dented but the exploder mechanism had suffered no damage and the detonator had not fired. This torpedo with the warhead and exploder mechanism was shipped to the Naval Torpedo Station, Newport, R.I.

After a careful analysis of the remaining seven torpedoes no damage was found other than that attributed to being loaded in tube for a long period of time without routine upkeep. These torpedoes were in good mechanical condition.

SUBMARINE TORPEDO TUBES

Preliminary inspections were made on the U.S.S. TUNA (SS 203), U.S.S. SEARAVEN (SS 196), U.S.S. SKATE (SS 305), U.S.S. DENTUDA (SS 335), and the U.S.S. PARCHE (SS 384). The general condition within torpedo rooms appeared good. Tail stops, speed, gyro and depth setting mechanisms operated satisfactory although sluggishly due to lack of routine upkeep during the period of Test "B" and decontamination when personnel were not allowed aboard the target vessels. Most of the tail stops were 1/4 to 1 turn loose indicating that inertia forces had deformed parts or taken up lost motion to this extent. Pressure drops in the impulse system were not such as to indicate damage and no tube had fired. Further tests and examinations were not performed due to radioactivity.

TORPEDOES, MARK 13, MOD. 1

Special test torpedoes, Mark 13, Mod. 1, were loaded in the same location as for Test "A", on the U.S.S. SARATOGA (CV 3). The U.S.S. INDEPENDENCE (CVL 22) was not used to display torpedoes in Test "B" due to damage sustained in

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TORPEDOES, MARK 13, MOD. 1. (Cont'd)

Test "A". The U.S.S. NEW YORK (BB 34) was substituted in lieu of the U.S.S. INDEPENDENCE (CVL 22) and only two torpedoes were used being placed on a torpedo truck and secured on deck, one on the starboard side and one on the port side on the superstructure deck near frame 75 and 56 respectively.

The torpedoes, Mark 13, Mod. 1, on board the U.S.S. SARATOGA (CV 3) were lost with the ship. The torpedoes displayed on the U.S.S. NEW YORK (BB 34) other than being rusty and radioactive, were found to be in good mechanical condition upon being given a shop analysis. The detonators and ignitors had not fired.

TORPEDOES, MARK 15, MOD. 3

At the conclusion of Test "B" all special test torpedoes, exploders and warheads recovered from target vessels (destroyers) plus four standard service torpedoes of which two were recovered from the U.S.S. HUGHES (DD 410) and two from the U.S.S. ANDERSON (DD 411) were returned to Destroyers Pacific Fleet Torpedo Shops for analytic overhaul and tests.

Upon arrival at Pearl most of the torpedo equipment was declared radioactive by the Radiological Safety Representative and therefore, further decontamination was carried out. The method of decontamination used brought all material within a tolerance which made them safe enough for carrying out the required tests.

All torpedo air flasks were given a routine hydraulic test at 4200 psi and passed as serviceable in all respects. Torpedo after bodies were checked tested then overhauled. No damage or dearrangement was noted. All tests and adjustment were found normal in all units, i.e., gyro, gyro housing, valve group, main engines and depth mechanisms.

Exploder mechanisms both the Mark 6, Mod. 6, used in the warheads attached to special test torpedoes and the Mark 6, Mod. 5, which were stowed in cases in torpedo work shops of target vessels (destroyers) were given all routine bench tests and were passed as serviceable in all respects.

Gyros and gyro housings were bench tested in the running stand and made normal runs. Except for the usual ball discoloration and pits in gyros that have been in service over a six months period all gyros were in excellent condition and no damage was found that could be attributed directly to bomb blast.

The torpedo stop tension links were broken in the U.S.S. MAYRANT (DD 402) and the U.S.S. HUGHES (DD 411) permitting torpedoes to slide overboard from

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TORPEDOES, MARK 15, MOD. 3 (Cont'd)

the tubes in both vessels. As in Test "A" the same condition is believed to have been the cause of the stop tension links breaking, i.e. a sudden violent snap-roll bring the torpedoes up hard against the forward stop and breaking the stop tension links. Then as the ship rolled to the opposite side the torpedoes which had not moved ahead far enough to leave the tube would slide back into the barrel with such force that the torpedo guide stud would be sheared off when it struck the torpedo tube after stop. When this happened the torpedoes would strike the tube door and bend the propellers.

Considerable residue was deposited on the paint surfaces in Test "A" but this did not occur in Test "B" however, radioactivity did in "B" hindered recovery work and caused much concern in attempting to clear up the ships.

All in all outside of the fact that the guide studs of torpedoes carried away the rest of the torpedo equipment appears satisfactory.

TEST "B"

ABOVE WATER TORPEDO TUBES

U.S.S. MAYRANT (DD 402)

After a careful inspection of the subject named vessel, the following described damage and disarrangement of the torpedo battery was noted:

The forward torpedo tubes, starboard and port were used for this test and are described herewith. Both tubes were trained abeam and secured in that position.

All barrels, loaded with torpedoes, were found to have broken tension links in the torpedo stops and it is presumed that this occurred when the ship was subjected to a violent "snap-roll" caused by the terrific shock burst which followed immediately after bomb detonation.

STARBOARD TUBE

The three (3) standard service torpedoes in this tube were launched and lost when the torpedo stop tension links carried away.

PORT TUBE

All torpedoes moved forward various distances in this tube, but none became operative, due to the fact that all tripping latches were secured in accordance with directives set forth in BuOrd pamphlet "Test Procedure for Above Water Torpedo Tubes", sheet (3) paragraph 6 (c).

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TEST "B" (Cont'd)

ABOVE WATER TORPEDO TUBES (Cont'd)

U.S.S. MAYRANT (DD 402) (Cont'd)

RIGHT AND LEFT BARRELS

These barrels were loaded with special test torpedoes, which were restricted to about one (1) foot forward movement, after stop tension links broke, by wire rope bridles rigged as preventatives in accordance with directives set forth in BuOrd Pamphlet "Test Procedure for Above Water Torpedo Tubes" sheet two (2) part four (4), paragraph two (2) (d).

RIGHT CENTER AND LEFT CENTER BARRELS

These barrels were loaded with standard service torpedoes which were prevented from sliding out clear of barrels by the crossed wire preventers rigged on Right and Left barrels of this tube. No other material damage to torpedoes was sustained by this vessel.

U.S.S. HUGHES (DD 410)

#1 TORPEDO TUBE MOUNT

Slight material damage was done by bomb blast. The steam line connections to heating elements on this mount were carried away, however, this could have happened while decontamination work was being carried out. All working parts such as training gear, gyro and depth setting mechanism, director controls, etc., were frozen or very hard to operate due to corrosion and verdigris which rapidly appeared on all exposed working parts after decontamination crews had saturated the ship with salt water and foam preparations in combating radio-activity.

All electrical wiring was intact but was not tested in power as no power was available to carry out such a test. Switches, plugs, etc., were tested by hand and found operable. Tubes were trained by hand, but with difficulty, due to lubricants being washed away by decontamination methods.

Three (3) of the torpedo stop tension links in #1 torpedo tube (forward centerline mount) were broken and the three (3) standard service torpedoes in these barrels were launched and lost when the ship rolled heavy to port.

#2 TORPEDO TUBE MOUNT

The same conditions prevailed in this mount as described above for Tube #1 except the standard service torpedoes loaded in the right and left barrels

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TEST "B" (Cont'd)

ABOVE WATER TORPEDO TUBES (Cont'd)

U.S.S. HUGHES (DD 410) (Cont'd)

#2 TORPEDO TUBE MOUNT (Cont'd)

remained and had their guide stud holding screws sheared off flush with air flask outside surface.

The torpedo shop tension links on these two barrels were broken and it is assumed that the torpedoes moved forward some distance when the ship rolled to starboard (this mount was trained out and secured at 090° for test, while #1 mount was trained out and secured at 270°) allowing the tube tripping latch to engage the torpedo starting lever forcing the lever to the rear and starting the torpedo to function, then it's assumed the ship rolled heavy to port, this caused the torpedoes to slide back into the tube barrels with such velocity as to cause the torpedo guide stud holding screws to be sheared off when guide stud struck torpedo back stop. Then with all securing gear carried away, the torpedoes were free to move aft in the barrels until the propeller locks (lashed to torpedo propellers) were then broken permitting the propellers to turn over while in contact with inside surface of breech doors and in so doing cut deep into the surface metal to a depth of 1/8 of an inch or more. Then as the ship rolled again to starboard the torpedoes moved forward and stuck when part way out of tubes. The torpedo in the left barrel traveled a little over half its length before it stopped, while the torpedo in the right barrel moved ahead 2/3 of its length before the tail surfaces fouled and the torpedo was bent downward 15 to 20 degrees by its own weight until the warhead touched the deck. The bend occurred in the after body just aft of the gyro door frame.

Both torpedoes were found to be highly radioactive but this was soon eliminated by scrubbing all tectyl preservative from outside surfaces, using paint thinner and clean rags. After four applications of this method the torpedoes were declared safe to handle and were removed to the U.S.S. DIXIE (AD 14) for an analysis overhaul. The warheads and exploder mechanisms of both these standard service torpedoes were taken to sea and dumped by order of CJTF-1.

Except for the damage to the torpedoes in U.S.S. HUGHES and U.S.S. MAYRANT, there was no other material damage sustained by the other destroyers of the target group. All were declared radioactive and required decontamination before special torpedo test materials could be recovered, but this was accomplished prior departure of target ships from Bikini.

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TORPEDO, Mark 27

The Torpedoes, Mark 27 placed on the submarines U.S.S. TUNA, U.S.S. SKATE, U.S.S. DENTUDA and the U.S.S. FARCHE were visually inspected and no physical damage was discovered. The detonators in the Exploders Mark 11 had not fired. These units were not radioactive and were removed for a shop analysis. The units on the U.S.S. PILOTFISH and U.S.S. APOGON were lost with the ships except the unit lashed to the deck of the U.S.S. APOGON which was removed by divers. The units removed from the decks of target destroyers were given an electronic check tickle test and leak meter test. The lead storage batteries were not damaged but the voltages of the "B" packs were low. With the exception of the hydrophones the units performed in a normal manner. The following hydrophones were damaged: J-2 and J-4 in unit 606T, J-4 in unit 637T, J-4 in unit 679T and J-1 in unit 647. None of these hydrophones would perform input when a tickle test was performed. When input was given the units, from outside signal generator, the elevators and rudders behaved in a normal manner. A tickle test was given these units when the hydrophone leads were reversed thereby indicating which hydrophones were defective. It is the opinion of the Special Weapons Officer that the hydrophones became defective because of the intense heat from the sun and not from direct effect of the bomb blast. The units removed from the submarines performed normally.

The unit removed from the deck of the U.S.S. APOGON was found to be badly damaged. The tail section of this unit was missing, the cylinder section crushed and the upper part of the nose was crushed. The Exploder Mark 11 was flooded so that it could not be tested. The exploder showed the least damage to visual examination and the detonator had not fired.

All the defective hydrophones and the unit removed from the deck of the U.S.S. APOGON were shipped to the Naval Mine Warfare Test Station, Solomons, Maryland for observation.

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SUMMARY

Examination has shown that, in general, Underwater Ordnance items and associated gear aboard surface target ships withstood the explosion better than most ship board items in the same vicinity. This is evidenced by the fact that no torpedo tubes, detonator boxes, impulse stowages or depth charge racks were materially damaged, although some bulkheads, hatches and doors were damaged on the same ship and in the same relative orientation to point of burst.

Particularly noteworthy is the fact that heat of sufficient intensity to scorch or blister paint on bulkheads of torpedo tubes, etc., in Test "A", did not in any way carbonize the grease on the protruding warhead of destroyer torpedoes. Faint that had been put on depth charges (to obliterate markings) was blistered where as the original paint on these same depth charges showed no signs of blistering, or intense heat. A torpedo tube spoon and spoon extender was found on the ARDC-13 after Test "A". There was no evidence of fragmentation and, as no destroyer torpedo tubes were detonated in Test "A", it is believed that this was torn from the ANDERSON by the blast. Divers reported the sighting of four torpedoes that were originally on board the LAMSON, and all of the torpedoes on the ANDERSON. Three of the LAMSON torpedoes were on the bottom of the Lagoon near the LAMSON while the fourth was broken over the lip of the tube. All the ANDERSON torpedoes were found on the bottom near the ship.

The only damage sustained to submarine torpedoes was of a secondary nature caused by the carrying away of securing straps and a portable cross-rail. A tube on the SKATE was damaged at the muzzle end, but the torpedo from this tube was unloaded without difficulty. The torpedo cradles in the submarines were slightly distorted which is believed to have been caused by the inertia of the torpedoes when the ship was blown rapidly to one side.

RECOMMENDATIONS

The Underwater Ordnance equipment in general does not appear to require modification to withstand Atomic bombs of the type used in Tests "A" and "B". However, it must be borne in mind that improved bombs will impose greater demands on this equipment. Specifically, it is recommended that the strength and design of the present type guide studs used on destroyers torpedoes be investigated as these studs were proved inadequate. It is also recommended that the present method of securing depth charges to their arbors be reviewed to prevent their loss as was the case in Test "B".

PRINZ EUGEN (IX-300)

Although no German Underwater Ordnance was specially prepared for Test "A", the torpedoes, ignitors and exploder mechanisms that were aboard were distributed throughout normal stowage spaces and some were placed in tubes. Three torpedoes were prepared, without complete overhaul, similarly to destroyer torpedoes with airflasks charged, dyes in various fuel and water compartments and inert exploder mechanisms in the live warheads.

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PRINZ EUGEN (IX-300) (Continued)

One of these prepared torpedoes was placed in a tube on the starboard side, one in a tube on the port side and one was left in ready stowage. Other air-flasks and after bodies were placed in tubes in each tube mount. Warheads were not available for these torpedoes. Splash covers were secured both open and closed on each side of the ship. All tube mounts were secured in the stowed position. After Test "A" an examination of all torpedoes, ignitors and exploder mechanisms was made with negative results. A visual examination after Test "B" disclosed no damage.

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S-E-C-R-E-T

Enclosure (D)

Subject:

Bureau of Ordnance Material
Group Final Report for
Tests "A" and "B".

PART VII - ARMOR AND METALLURGY

S-E-C-R-E-T

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S E C R E T

ARMOR AND METALLURGY

1. Forty-two armor plates and samples of known ballistic, chemical and metallurgical properties representing current manufacture of all types and gauges were exposed to Test "A" aboard the NEVADA, ARKANSAS, PENSACOLA and SALT LAKE CITY. The above ships were selected because their positions in the target array presented an exposure to the air burst at varying distances from and including the theoretical target. In addition it was necessary to select vessels with large hulls such as battleships and cruisers with adequate space and deck support. The method of securing the armor plates and samples was established giving consideration to anticipated shock, fusion, etc. An adequate design was established consisting namely of heavy steel corner pieces welded to steel decks with heavy steel securing clips welded to corner pieces with clip and samples separated by wood and asbestos fillers. In the case of the four (4) heavy plates installed on the NEVADA it was found necessary to shore the area under the plates for two deck levels in order to provide adequate shock resistant supports for the heavy weight plates. See photographs serial numbers BACR 83-272-5,6,7,8,12 and BACR 87-948-9 which show typical armor plate and sample installations.

Inspections after Test "A" revealed no apparent visual damage to any of the above plates or samples with the exception of one 1.5" special treatment steel plate located on the fantail of each the ARKANSAS and PENSACOLA. These plates which were well secured to the deck of these ships, were bent to the contour of the caved-in decks of each ship. It is estimated that the deflection of the plates was 10" to 12" and upon releasing the securing clips in removing the plate from the ship after the test a slight permanent set appeared to have taken place though no measurements could be taken. Photographs serial numbers BACR 83-273-3 and AACR 81-1667-7 on the ARKANSAS and serial numbers BACR 148-272-2 and AACR 81-1668-2 on the PENSACOLA show before and after shots respectively of the deflected plates.

The indicating paint stripes on scattered samples and plates did not show any temperatures greater than 400 degrees.

It was noted that the class "A" armor plates which had impacts, spalls and cracks prior to the test showed no change after the test.

Supplementary information regarding any effects of the atomic bomb will be furnished by Naval Proving Ground, Dahlgren, after ballistic and metallurgical examination and tests of the test samples and plates.

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ARMOR AND METALLURGY. (Continued)

2. A visual examination of ships armor structures by the ship's forces and by the metallurgical personnel after the test indicate no apparent damage and all armor intact. Faint discoloration occurred in varying degrees depending on the distance of the armor from the explosion. Some ships reported blistering of paint but upon examination it was revealed that this condition was due to the burning of Army Quartermaster equipment nearby. As a matter of interest it is noted that two large loose spalls located between the main and third deck on barbette number one, U.S.S. ARKANSAS, were unaffected.

No visual damage was detected or observed on any cast armor structures.

3. Brinell hardness readings were taken with a portable telebrineller on the muzzle end of the 12" guns of the U.S.S. ARKANSAS after Test "A" and they indicated no change in the hardness and strength of the gun steel.

4. Observations of this unit together with ship's forces reports indicate that armor and special treatment steel greater than 15# gauge (3/8"), properly supported could withstand the air blast without distortion and provides excellent protection against air blast and flash heat. An outstanding example of the above is the 50# gauge special treatment steel conning tower on the U.S.S. SKATE which remained unaffected.

5. A considerable number of aluminum castings such as searchlight parts, spotting glass supports, Mark 14 gun sight brackets, and radar antenna brackets failed to withstand the shock and were broken.

6. Photographs serial BACR 87-948-5,6 show shields aboard the Japanese cruiser SAKAWA. Hardness tests taken on these shields indicated they were not armor but comparable to a mild steel. Heavy damage was sustained to the after shields which were nearer the explosion but due to sinking of the vessel, no photographs could be taken nor was it possible to conduct a visual examination to determine the extent of the damage.

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S E C R E T

1. **ARMOR**

(a) Special Armor.

In accordance with decision by Commander Joint Task Force ONE, no additional special armor test samples were exposed on the decks of target vessels for Test "B". This decision was primarily based on the following:

- (1) Elimination of heat effect due to subsurface detonation for Test "B".
- (2) The armor test samples exposed for Test "A" showed no apparent visible damage and some Test "A" samples remained on the target vessels.

Seven plates having sizes and weights as listed below, which were exposed to Test "A" aboard the U.S.S. NEVADA, were not removed prior to Test "B" in view of inadequate handling and lifting facilities available at Bikini and were therefore subjected to both tests:

<u>PLATE NO.</u>	<u>TYPE</u>	<u>SIZE</u>	<u>WEIGHT (LBS)</u>
RR804	Class A	19'4"x10'x12"	96,600
10359	Class B	19'x10'x10.5"	82,500
35E556A2	Class A	19'x10'x6"	47,500
TT415	Class B	18'6"x10'6"	46,000
12263	Class B	20'x10'x3"	25,000
063895	STS	214"x102"x2"	12,000
65835-B	STS	20'x6'x0.5"	2,400

Three metallurgical samples from each of the first four plates listed above were subjected to Test "A" aboard the NEVADA, ARKANSAS, and PENSACOLA, and were returned to the Naval Proving Grounds, Dahlgren, after the test for a comprehensive metallurgical examination in order to determine any effects caused by Test "A". Visual examination of the seven special armor plates aboard the NEVADA after Test "B" showed no apparent damage. Paint on the plates was completely or partially removed by the decontamination mixture, depending on the amount of mixture to which they were subjected. Discoloration of plate surfaces caused by Test "A" was also removed. These plates will remain aboard the NEVADA until such time that the ship is available at a Naval Shipyard or other establishment having adequate handling and lifting facilities for their removal.

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1. ARMOR

(a) Special Armor, (Continued)

They will, when removed, be shipped to the Naval Proving Grounds, Dahlgren, for ballistic tests and metallurgical examination to determine any possible effects incurred by Tests "A" and "B".

(b) Ship's Armor

The Ship's armored structures were inspected and all were found to be intact and not distorted. Direct visual inspection of battleship side belt armor was not possible, but an examination of the backing-up-plates and armor belts showed no distortion or bolt movement indicating that the side belt armor was not damaged. There were indications of severe shock and stresses in the immediate area of some armored structures but there was no evidence of joint failures or distortion of the armored structures. This was especially proven in the case of the 8"/55 caliber shields on the PENSACOLA. Armored decks, splinter decks, gratings and hatches were intact and not distorted as revealed by the visual inspections. Paint discoloration, scorching and blistering reported after Test "A" was completely removed where subjected to decontamination mixtures showing that the outer paint layers only were affected on Test "A".

(c) Conclusions

Armor and special treatment steel is highly resistant to the shock and stresses created by the subsurface explosion of the Atomic Bomb.

2. The metallurgical aspects of the effect of the test were observed from various fractures and cracked parts.

- (a) Two holding down clips in turret four on the U.S.S. NEW YORK were inspected. The clip at approximately 245 degrees relative when turret is trained 180 degrees relative showed evidence of heavy shock. A horizontal crack was propagated about 6 inches from the bottom of the clip on the inboard side for a length of about 6 inches. This can be further located as being at the end of the taper from the heavy bottom section of the clip. The crack appeared to have propagated from the weakest structural point in the vicinity of the area which was most highly stressed by the shock.

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2. (a) Continued.

The adjusting screws on this clip gouged the bearing surface and edge of the shoulder to a height of about 1.5" thus indicating a total upward movement of at least 2 inches. This is shown in photographs ABCR 234-2207-1 and 2. The holding down clip at approximately 315 degrees relative, located at the positive buffer stop when the turret is trained 180 degrees, was fractured across the entire length of the clip at the same relative location as described for the previous clip inspected. The fractured heavy section was resting on the positive buffer stop free from the upper part of the clip. A visual examination of the fractured surface revealed that the inboard edge of the fracture was heavily oxidized along the entire length of the clip on an area varying in width from .25 to .5 inches. This would indicate that, prior to Tests "A" and "B" of this operation, this clip had been highly stressed and a crack of the oxidized width had propagated. This crack acted as a notch effect in the clip structure for the shock received in Test "B" and thereby aided in completely fracturing the clip. The unoxidized portion of the fracture showed typical fine-grained, shiny cast steel structure. This is shown in photographs ABCR 234-4,5,6 and 7.

- (b) The after center line holding down clip in turret two of the U.S.S. NEVADA showed evidence of severe shock. However, in this case the entire clip was torn away from its position by shearing of the holding down clip securing bolts. There was no evidence of fracture of the clip itself.
- (c) On 5"/38 caliber mount number two on the U.S.S. HUGHES evidence of the shock was found in the elongation of the left cap square bolts. Precise measurement of the amount of elongation could not be made because necessary instruments were not at hand but it is estimated that elongation was approximately 3 percent. This resulted in loosening of the cap square beyond the keeper screw and made possible the removal of the bolts by hand.
- (d) Aluminum alloy castings failed due to shock and corrosion. On one Mark 14 sight bracket aboard the U.S.S. SALT LAKE CITY the evidence of corrosion was prevalent in area where the steel bolts are used to secure the bracket to the 20MM mount. The corrosion weakened the bracket structure and with little shock the casting fractured in the securing bolt areas. Corrosion was due to electrolytic action between the aluminum and the steel bolts.

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2. (Continued)

- (e) Decontamination procedures used for this operation contained lye which is known to have active corrosive effects on aluminum. When lye (Sodium-Hydroxide) comes in contact with an aluminum surface an aluminum hydroxide is formed which is not a protective coating, but rather tends to further corrode the aluminum. This corrosion will continue as long as any hydroxide is present.

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Defense Special Weapons Agency
6801 Telegraph Road
Alexandria, Virginia 22310-3398

TRC

18 April 1997

MEMORANDUM FOR DEFENSE TECHNICAL INFORMATION CENTER
ATTENTION: OMI/Mr. William Bush (Security)

SUBJECT: Declassification of Reports

The Defense Special Weapons Agency has declassified the following reports:

✓✓AD-366588 4	XRD-203-Section 12 ✓
X ——— AD-366589 ✓	XRD-200-Section 9 ✓
AD-366590 ✓	XRD-204-Section 13 ✓
AD-366591 ✓	XRD-183 ✓
✓✓AD-366586 X	XRD-201-Section 10 ✓
✓✓AD-367487 4	XRD-131-Volume 2 ✓
✓✓AD-367516 4	XRD-143 ✓
✓✓AD-367493 4	XRD-142 ✓
AD-801410L ✓	XRD-138 ✓
AD-376831L ✓	XRD-83 ✓
AD-366759 ✓	XRD-80 ✓
✓✓AD-376830L 4	XRD-79 ✓
✓✓AD-376828L 4	XRD-76 ✓
✓✓AD-367464 X	XRD-106 ✓
AD-801404L ✓	XRD-105-Volume 1 ✓
✓✓AD-367459 X	XRD-100 ✓

TRC

18 April 1997

Subject: Declassification of Reports

✓✓ AD-367517 ✕	XRD-141 ✓
AD-366762 ✓	XRD-84 ✓
AD-366760 ✓	XRD-81 ✓
AD-366761 ✓	XRD-82 ✓
AD-367501 ✓	XRD-158-Volume 1 ✓
AD-367507L ✓	XRD-152-Volume 4 ✓
✓✓ AD-367495 ✕	XRD-184 ✓
✓✓ AD-367485 ✕	XRD-129 ✓
✓✓ AD-367484 ✕	XRD-128 ✓
✓ AD-367483 ✕	XRD-127 ✓
✓ AD-367482 ✕	XRD-126 ✓
AD-367488 ✓	XRD-132
✓ AD-367480 ✕	XRD-124 ✓
AD-801409L ✓	XRD-135 ✓
✓ AD-367490 ✕	XRD-136 ✓
✓ AD-367492 ✕	XRD-137 ✓
AD-801411L ✓	XRD-139 ✓
✓ AD-367518 ✕	XRD-140 ✓
AD-367515 ✓	XRD-144 ✓
AD-367514 ✓	XRD-145 ✓
✓ AD-367468 ✕	XRD-110-Volume 2 ✓
AD-367513 ✓	XRD-146 ✓
✓ AD-367497 ✕	XRD-162 ✓

TRC

18 April 1997

Subject: Declassification of Reports

AD-801406L ✓ XRD-114✓

In addition, all of the cited reports are now **approved for public release; distribution statement "A" now applies.**

Ardith Jarrett
ARDITH JARRETT
Chief, Technical Resource Center